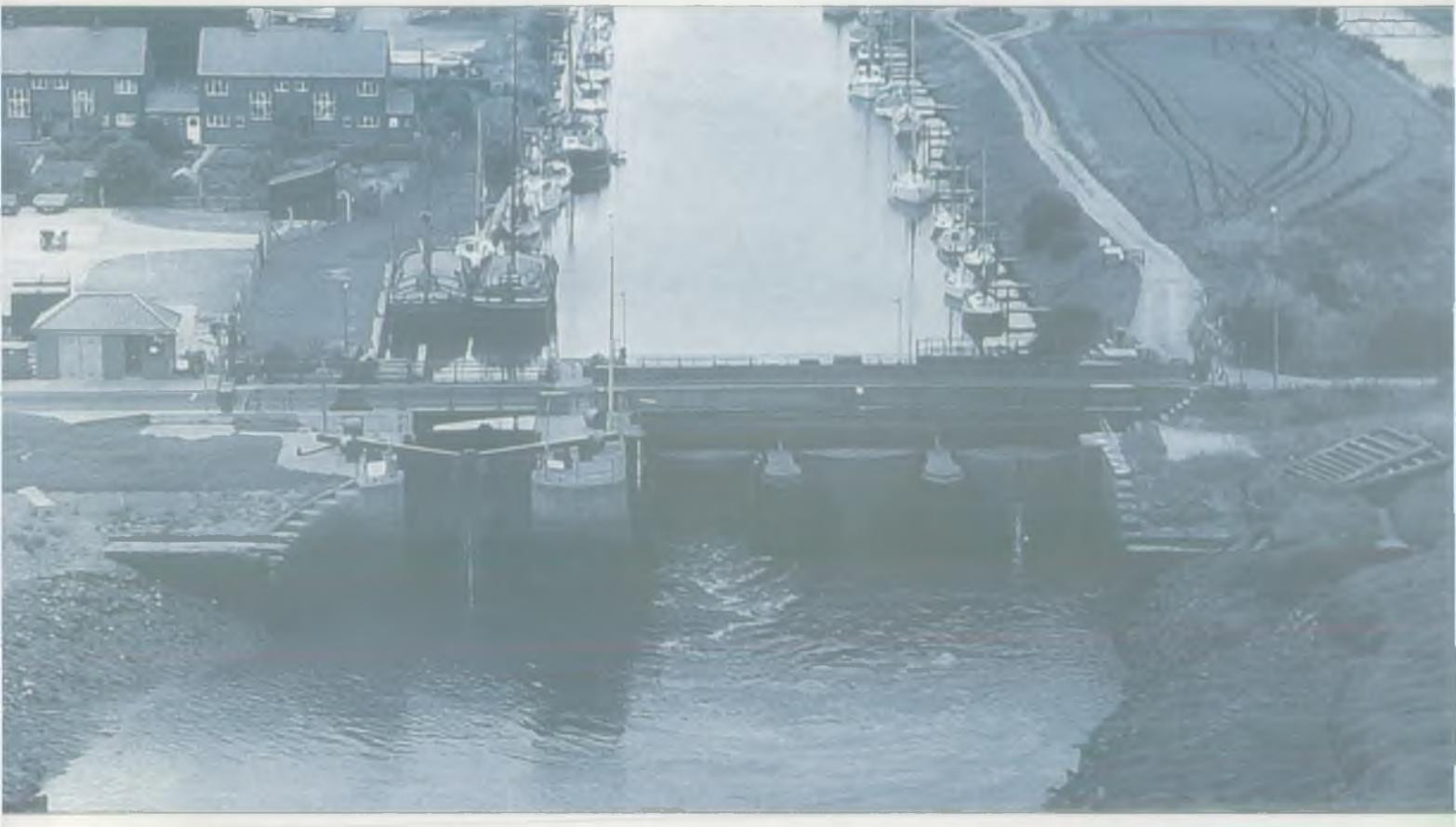
RIVER ANCHOLME
CATCHMENT MANAGEMENT PLAN
CONSULTATION REPORT



NRA

National Rivers Authority
Anglian Region

JANUARY 1996

CATCHMENT FACTS

GENERAL

Population	approx. 46,000	
Area	618 km²	
Ground Levels	Maximum	100m ODN
	Minimum	2m ODN
Highest Recorded Tide	5.35 ODN (Jan '78)	

ADMINISTRATIVE DETAILS

County Councils
Humberside
Lincolnshire

District Councils
Glandford
West Lindsey

Borough Councils
Scunthorpe

Navigation Authorities

National Rivers Authority		33km
NRA	Anglian Region - Northern Area Lincs Catchment	

Water Company
Anglian Water Services Ltd

Major S.T.W	Brigg
	Broughton
	Market Rasen
	Winteringham

Internal Drainage Board
Ancholme

Settlements (> 2000 population)

Brigg	5862
Broughton	5030
Caistor	2931
Market Rasen	3496
Scawby	2589
Winterton	5249

Utilities
East Midlands Electricity
British Gas
British Telecom
Anglian Water Services

WATER QUALITY

General Quality Assessment of Rivers

GQA Grade	Km
A	8.2
B	59.1
C	5.9
D	26.4
E	23.9
F	0

WATER RESOURCES AVAILABILITY

Ground Water
All available resources(Lincolnshire Limestone) are fully committed.

Surface Water
There is some scope for development utilising resources which can be made available by taking advantage of the Trent Witham Ancholme river transfer scheme. Apart from this resource, water is only available for abstraction during the winter period.

FLOOD PROTECTION

Length of Statutory Main River	188km
Length of NRA Tidal Defences	11km

FISHERIES

Length of cyprinid fishery	66km
Length of salmonid fishery	7km

CONSERVATION

Sites of Special Scientific Interest	17
Sites of Nature Conservation Interest	28
Nature Reserve	3
Scheduled Monument	20

ENVIRONMENT AGENCY

HEAD OFFICE

Rio House, Waterside Drive,
Aztec West, Almondsbury,
Bristol BS32 4UD

THE NRA'S VISION FOR THE RIVER ANCHOLME CATCHMENT

The NRA was established in 1989 and has the role of "Guardian of the Water Environment", it aims to balance the legitimate interests of all those who use the water environment and to ensure that future development is sustainable. Sustainable development is seen as "development which meets the needs of the present without compromising the ability of future generations to meet their own needs"(Bruntland Report 1987).

The Catchment is home to approximately 49,000 people and the NRA's vision for it is to create a river and wetland environment that these people will want to use, live and work within. This will involve the protection of high quality habitats and where appropriate work towards enhancing the water environment.

Over the last few centuries man's activities have fundamentally influenced and altered the landscape to create productive arable farmland. The fenland/meadow land that would have dominated the 13th century landscape has all but disappeared. The NRA's challenge in this catchment is not to turn the clock back. It is to re-dress the balance and improve the conservation value of the Catchment, whilst achieving the sustainable management and protection of the quality and quantity of surface and ground waters, the provision of effective flood defences and the development of recreational potential.

Within the 5 year life of this plan the NRA and partners aim to achieve the following key actions which will represent a significant step towards the sustainable management of the Ancholme Catchment.

- to integrate the needs of flood defence and conservation to increase the standard of flood protection whilst improving the diversity of riverine habitat and associate plant and animal species.
- to maintain and improve water quality.
- to refurbish South Ferriby Lock to maintain navigation passage with the Humber.
- to continue to operate and effectively manage the Trent Witham Ancholme Water Transfer Scheme.
- to maintain and improve fish populations.
- to coordinate the recreational demands on the catchment.

MAP OF THE CATCHMENT

Front Cover: South Ferriby Lock

RIVER ANCHOLME CATCHMENT MANAGEMENT PLAN

FOREWORD

The National Rivers Authority, NRA, was created in 1989 as an independent environmental watchdog. It has as its prime purpose the protection and improvement of the aquatic environment throughout England and Wales.

In achieving this purpose the NRA seeks to effectively manage water resources, substantially reduce pollution and provide effective flood defence for people and property. It aims to operate openly and balance the interests of all who benefit from and use rivers, groundwaters, estuaries and coastal waters.

The NRA has chosen to develop the concept of Catchment Management Planning to help it achieve its aims. A Catchment Management Plan (CMP) treats a river, together with the land, tributaries and underground water connected with it, as a discrete unit or catchment. The approach considers all major uses which impact upon the water environment in a catchment. It seeks to identify and resolve problems within the catchment in an integrated way, developing a partnership approach, where appropriate, towards dealing with those problems.

This document marks the start of that process by inviting the public and all organisations with an interest in the water environment to comment on its contents, to identify their concerns for the River Ancholme Catchment and to suggest any options for their solutions.

The River Ancholme Catchment includes some of the most productive and intensively farmed arable land in England. The conversion and use of land for agricultural purposes in the Ancholme valley over the centuries has significantly transformed what would have been a wetland environment, subject to regular inundation and a haven for wildlife, into one of substantial agricultural and economic value protected from inundation by fluvial and tidal defences. Large tracks of the Ancholme valley lie at or below high tide levels.

On the slopes of the valley there are extensive woodlands at South Willingham and at Broughton, only remnants of which survive on the valley floor. In the Winterton Beck sub-catchment extensive mining operations have changed the character of that valley to the extent that the route of the Winterton Beck has been significantly altered.

Water resources in the catchment are supplemented by a pipeline transfer providing water from the River Trent via the River Witham into the River Ancholme at Newton by Toft.

RON LINFIELD
Northern Area Manager
10 January 1995

Please respond with your comments to:-

Catchment Planning Officer
National Rivers Authority
Northern Area
Aqua House
Harvey Street
Lincoln
LN1 1TF

Tel: 01522 513100

RIVER ANCHOLME CATCHMENT MANAGEMENT PLAN

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1. CONCEPT AND PROCESS

The water environment is increasingly becoming a focus for a range of uses and activities. The National Rivers Authority is the major environmental protection agency responsible for examining the interaction between such activities and uses, and the water and associated land environment. It tries to reconcile any conflicts that may arise, and generally protect, and where possible improve, the water environment for the benefit of future generations in line with the principles of sustainable development.

Sustainable development is at the heart of international and UK policy on the environment. The most widely accepted definition of sustainable development is that of the 1987 Brundtland Report: "...development that meets the needs of the present without compromising the ability of future generations to meet their own needs". This has been further developed through Agenda 21, the action plan for the next century, endorsed at the 1992 UN conference on environment and development held in Rio de Janeiro (the 'Earth Summit').

Sustainable development must embrace environmental, social and economic concerns for it to be a workable concept. The NRA's challenge is to apply it to the water environment.

The NRA's responsibilities are wide reaching and include:

- effective management of water resources;
- control of pollution and improving the quality of rivers, groundwaters, estuary and coastal waters;
- flood defence, including the protection of people and property;
- maintenance, improvement and development of fisheries;
- conservation and enhancement of the natural water environment;
- promotion of water-based recreation including navigation.

To plan for environmental sustainability and improvement, the NRA has developed the concept of Catchment Management Planning as an integrated, efficient and effective approach to the consideration of the full range of water management issues within a river catchment.

Catchment Management Plans (CMPs) enable individual catchment needs to be taken into account in the management decisions which aim to make real improvements at local level to meet the community's needs. This process of integrated catchment management will enable resources to be targeted where they are most needed.

In managing catchments the NRA aims to:-

- manage water resources to achieve the right balance between the needs of the environment and those of the abstractors;
- control pollution, respond promptly to pollution incidents, and work with dischargers to achieve improvements;
- provide effective defence for people and property against flooding from rivers and the sea, including provision of flood warnings;
- develop fisheries, promote recreation and navigation.
- conserve and enhance wildlife landscape and archaeological features associated with inland and coastal waters;
- determine, police, enforce and review the conditions in water abstraction licences, discharge consents, and land drainage consents to achieve operational objectives;
- influence planning authorities to control development to meet NRA objectives for protecting and enhancing the water environment.

The preparation of a CMP will require the NRA to:-

- identify the catchment uses and physical attributes;
- set targets for a range of catchment uses;
- compare existing targets with the current status of the water environment to identify shortfalls;
- identify issues and options to address the shortfalls;
- undertake consultation on the uses, targets, issues and options;
- prepare an action plan to address the issues;
- implement the action plan and maintain on-going monitoring and review of the plan.

In producing the CMP the NRA recognises that to achieve its aims it must seek to influence and work with central government, industry, commerce, local authorities, farming, conservation bodies and the general public. It must also take account of other ongoing initiatives such as the production of Development Plans and Water Level Management Plans. An important step in the CMP process is the public consultation on the NRA's draft plan.

Through detailed consultation with all interested organisations the NRA seeks to:

Through detailed consultation with all interested organisations the NRA seeks to:

- confirm the range and extent of catchment uses and activities;
- obtain views on the issues facing the water environment identified in the Report;
- begin the process of identifying action plans;
- ensure decisions on the future management of the catchment are based on a wide range of views from interested parties.

The publication of this consultation report marks the start of a three month period of formal consultation. This will enable external organisations and the general public to work with the NRA in planning the future of the water environment in the River Ancholme Catchment.

FEEDBACK ON THE PLAN

The NRA positively welcomes feedback on this plan.

When commenting on this document the NRA requests that organisations and the general public will consider both points of detail and the following questions:

- have the issues been adequately assessed?
- what are the opinions of consultees on these issues and the options identified?
- are there any issues or options which have not been identified?

The consultation period for the Plan ends on 10 April 1996. Those wishing to comment should write to the following address:

Catchment Planning Officer, National Rivers Authority, Northern Area, Aqua House, Harvey Street, Lincoln, LN1 1TF.

Following the consultation period the NRA will produce an Action Plan which will form the basis for both the NRA's and other partners' actions within the catchment over the following 5 year period. The NRA will seek the commitment to planned actions by others where necessary.

A summary of the CMP process and relevant timescales for the Ancholme CMP are shown in Table 1.

TABLE 1 - THE CATCHMENT PLANNING PROCESS
RIVER ANCHOLME CATCHMENT TIMETABLE

NRA CMP Team Formed	July 1995
NRA identify catchment uses, catchment current state, catchment targets and catchment shortfalls against targets	
NRA initial thoughts on catchment issues	
Pre-Consultation with: - Angling Interests - Conservation Interests - Planning Authorities - Navigation Interests - Water Companies - Industry - NFU - County Archaeologists	September 1995
< Feedback	
Completion and Launch of Draft Consultation Document	January 1996
Full Public Consultation	January-April 1996
< Feedback	
NRA Produce Action Plan with 5 Year Horizon	July 1996
Annual Monitoring	Ongoing 1997 → 2000
Review	2001

During each of the development stages of this Plan, the NRA works in close liaison with its customer consultative group, the Lincolnshire Catchment Panel.

The NRA would like to acknowledge the help received from those organisations and their representatives who have contributed towards the development of this Consultation Document.

THE OTHER PLAYERS

In addition to the NRA there are many other bodies and organisations which have an important role to play in improving the water environment. The NRA also has a wide range of customers with whom it has contact or to whom it provides a service. These include the general public and many representative groups and businesses that form part of the community in the catchment. The following organisations have key responsibilities relevant to the protection of the water environment in the Ancholme catchment:

- ADAS Formerly the Agricultural Development and Advisory Service.
- Department of Environment (DoE) are sponsors of the NRA.
- Ministry of Agriculture, Fisheries and Food (MAFF) are also sponsors of the NRA and have an important role in flood defence, fisheries and the prevention of agricultural pollution. One of MAFF's aims is to balance the interests of agriculture with the conservation of the countryside. MAFF is responsible for administrating various schemes including Nitrate Sensitive Areas and Nitrate Vulnerable Zones.
- English Nature (EN) are responsible for the protection and management of SSSIs.
- Countryside Commission an important role in the conservation of landscape.
- Anglian Water Services Ltd (AWSL) are responsible for water supply and sewage treatment/disposal.
- Local Authorities (LA's) have a role in environmental health and land drainage and are responsible for dealing with planning (including minerals), and waste disposal.
- Industrial and Trade Associations such as Confederation of British Industry (CBI) and National Farmers Union (NFU) etc. - have an important role, via their members, in the alleviation of pollution risks.
- Angling and Recreation Groups act as vital watchdogs.
- Her Majesty's Inspectorate of Pollution (HMIP) is responsible for authorising industrial processes under Integrated Pollution Control.
- Ancholme Internal Drainage Board is responsible for the supervision of land drainage within it's defined district.
- Industry Water Companies and Agriculture are the principal water abstractors and effluent dischargers in the catchment.

- Inland Waterways Association seeks to promote the development and use of waterways for navigation, other recreation and amenity purposes.
- Land and Riparian Owners are responsible for aspects of land and river management/maintenance.
- The Media can readily influence public opinion.
- Pressure Groups can also influence public opinion on environmental matters.
- The Public who use, enjoy and have an interest in the water environment.
- Voluntary Conservation Bodies provide specialist advice to the other players.
- Farming and Wildlife Advisory Group (FWAG) provide advice and assistance to the farming community on matters associated with wildlife and the environment.
- Country Landowners Association (CLA) represent landowners on issues and consultations which affect their interests.
- County Archaeologists (County Council) maintain a detailed list of known archaeological sites and primary source of archaeological information and advice.

2. OVERVIEW

2.1 INTRODUCTION

The River Ancholme Catchment is located in North Lincolnshire and South Humberside and covers an area of 618 square kilometres, main tributaries to the Ancholme include the River Rase, North Kelsey Beck, Land Drain and West Drain. The sub catchment of the Winterton Beck has been included in the Plan area.

The catchment is situated within the administrative boundaries of Lincolnshire and Humberside County Councils, Scunthorpe Borough Council, and the District Councils of Glanford and West Lindsey. Main population centres are at Brigg, Winterton and Market Rasen -the village of Broughton has grown significantly over recent years reflecting the historical drift of population away from rural to urban areas. A small part of Scunthorpe lies in the western extreme of the catchment. Industry and employment within the catchment is closely allied to the farming sector.

The majority of the Ancholme catchment is rural and lies within a broad clay vale, between the tracts of higher ground of the Lincolnshire Cliff in the west and the Lincolnshire Wolds in the east. The boundary between the clay and the limestone of the Lincolnshire Cliff is characterised by a chain of settlements which vary greatly in size and character. The predominant land use is agriculture with large regular fields of productive and highly versatile soils supporting crops of cereal, potatoes, beet and vegetables. Tree and woodland cover is sparse in places, particularly to the north of the catchment, becoming more dominant in the south and around the edges of the catchment, for example at Twigmoor Woods. Two areas within the catchment have been identified within the Humberside Structure Plan as Areas of Great Landscape Value.

THE CATCHMENT AREA IS SHOWN ON THE INSIDE FACE OF THE FRONT COVER

2.2 ADJACENT AND OVERLAPPING PLANS

CMPs for the adjacent Louth (August 1993), Grimsby (September 1995), and Humber Estuary (May 1995) Catchments have already been produced. As a consequence of the overlap between the Humber CMP and this Plan, there are issues common to both. Where this is the case, for example, those issues relating to tidal defences, the actions to resolve the issues are laid down in the Humber Action Plan. These details are summarised in the "Current Status" section of this document. This Plan does not propose to review these issues which have already gone through the Consultation Process.

Over the course of the last year English Nature in conjunction with many other organisations including the NRA,the RSPB and Humberside County Council have been developing a Humber Estuary Management Strategy. This Strategy will consider a wider range of matters than the NRA's CMP,for example industry and tourism in the catchment. This Plan is to be integrated with the NRA's CMP over

the coming months and published as the Humber Estuary Management Strategy in May 1996 (as a Consultation Document) for comment.

CMP's for the adjacent Upper Witham and Lower Trent Catchments will be produced during 1997/8. The NRA recognises the links between adjacent Plans and will ensure that they are compatible.

ADJACENT CMPs ARE SHOWN ON MAP NO. 1

2.3 RIVER ANCHOLME - HISTORICAL PERSPECTIVE

The River Ancholme as it is seen today, is largely the result of several centuries of man's labours. The historic landscape of thousands of hectares of fresh and salt water marshes/meadows abundant with wildlife is now replaced with productive arable farmland. This fundamental land use change had its beginnings back in the latter years of the 13th century. In 1294 works were undertaken to straighten the course of the Ancholme from Bishops Bridge to the Humber. This was done to facilitate the passage of cargo boats laden with corn and other cargo and would also have the effect of draining some areas of land. By 1312 however, siltation had reduced the depth of the river channel and so began the regular task of dredging and bank works which has continued through the centuries to the present day.

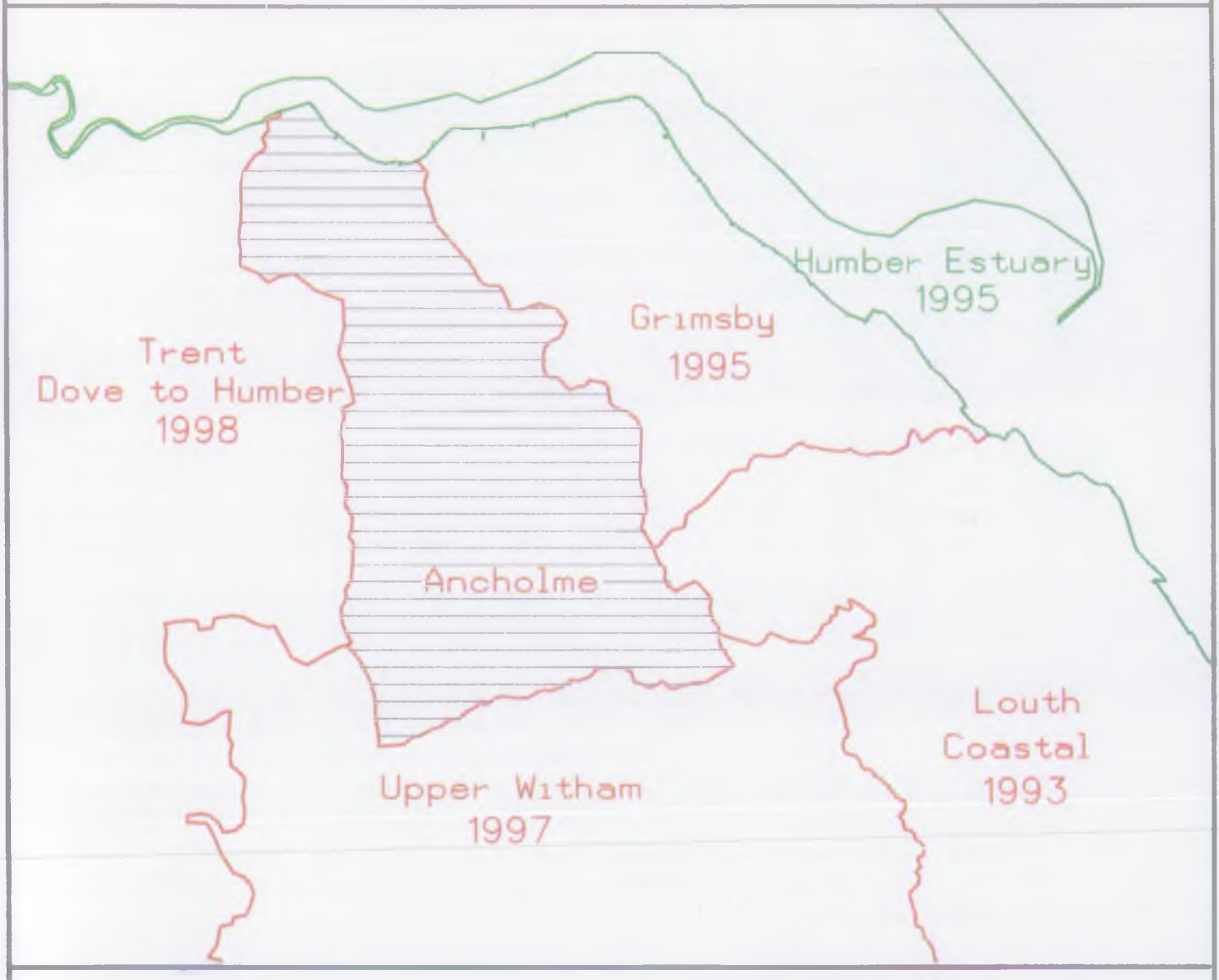
In 1635 the first sluice was constructed at South Ferriby. Prior to this the connection between the Humber and the Ancholme was open and the lower reaches of the river were tidal. The sluice was reconstructed following the Act of 1767 which formed the Commissioners of the Ancholme Drainage and Navigation.

Around the turn of the 19th century, the navigation was extended with the construction of the Caistor Canal (1793) and the construction of Harlem Hill Lock (1827). This was a busy period for the navigation as it provided a link for cargo and passengers from Bishops Bridge down the length of the Ancholme to the major industrial towns of Yorkshire and beyond.

The use of water from the river for industry was minor (apart from a mill at Brigg) up to 1918 when the rapidly expanding steel works at Scunthorpe required more water. In 1929 further demands for water occurred with the construction of the factory at Brigg by the Lincolnshire Beet Company. This company imported by barge about 45,000 tons of raw sugar per year.

In the 1930's the River Ancholme and Winterton Beck Catchment Board was constituted and took over the role of the Old Commissioners. Although the level of water had been maintained for navigation purposes, the land had shrunk causing land drainage to become unsatisfactory. Consequently, a scheme for improving and lowering the river bed went ahead in the 1930's which significantly improved land drainage and flood protection in the catchment. By this time boat traffic on the river had declined but some cargo craft carrying over 90 tonnes still occurred. By the 1960's the numbers of pleasure craft on the river were increasing.

ADJACENT CATCHMENT MANAGEMENT PLAN AREAS



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ANCHOLME CATCHMENT MANAGEMENT PLAN
JANUARY 1996 MAP NUMBER 1

2.4 HYDROLOGY

The catchment covers an area of 618 square kilometres and it's principal river is the Ancholme which is effectively a straightened river channel, embanked along its length from Bishopbridge to its outfall to the Humber estuary at South Ferriby. Water levels are controlled and maintained by the manned sluice structure at South Ferriby. The Kingerby beck, Nettleton beck, North Kelsey beck and Waddingham beck are tributaries of the River Ancholme which provide small local springflows from the limestone and chalk to either side of the main Ancholme.

The natural resources of the River Ancholme in summer must be considered small as there is little significant spring flow. In winter in contrast there are potentially large volumes of runoff from the catchment and flooding can occur.

2.5 HYDROGEOLOGY

The catchment is underlain by a series of sedimentary rocks gently dipping to the east, which have been weathered to create a series of hills and vales running approximately north to south. The solid geology has since been overlain by extensive areas of glacial and fluvial deposits and wind blown sands.

THE CATCHMENT'S MAJOR AQUIFERS AND HYDROMETRIC DETAILS ARE SHOWN ON MAP NO. 2

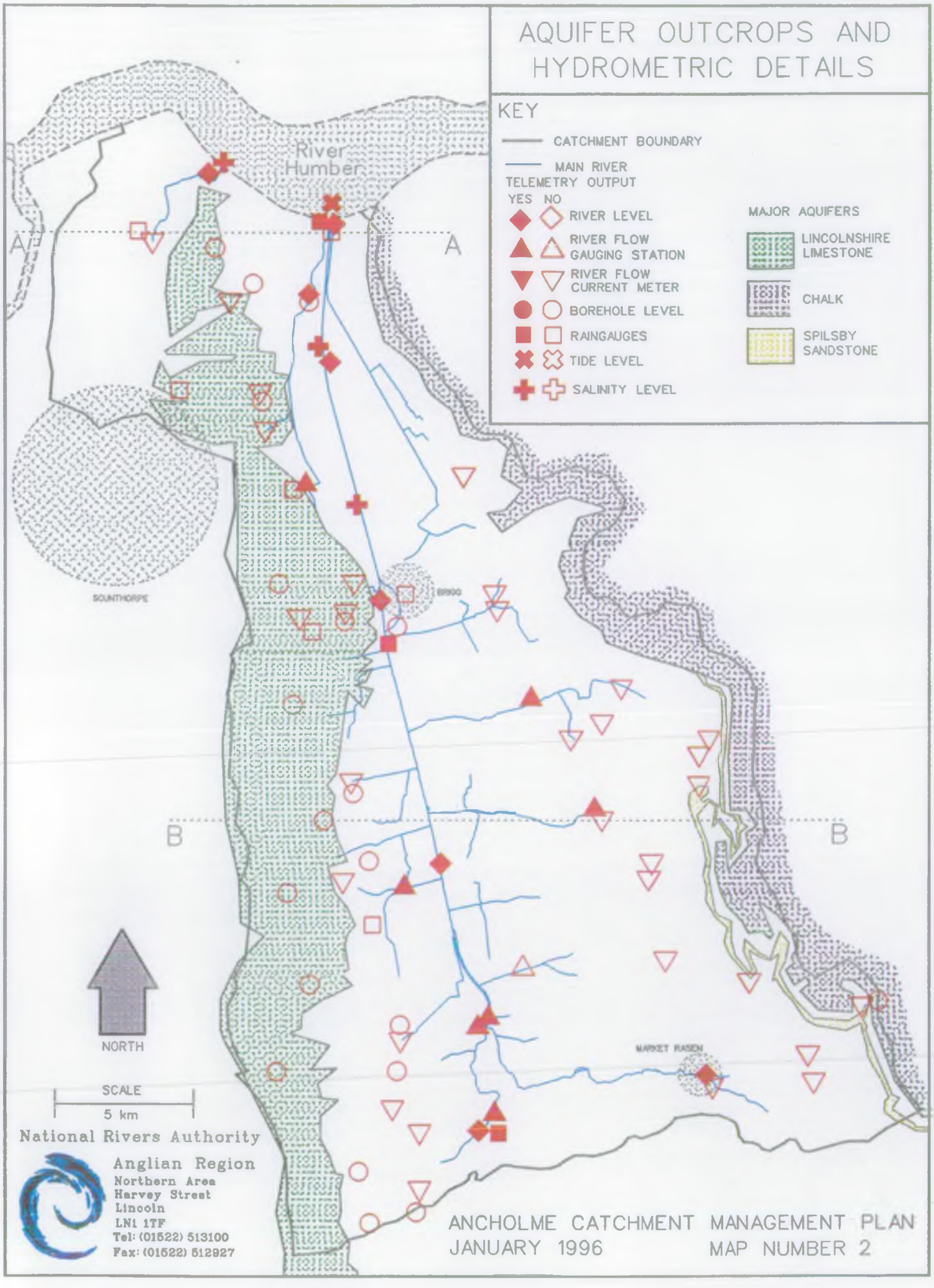
Figure 1 shows the geological cross sections

The Lower Lias to the west of the Limestone in the north west of the catchment drains to the Winterton Beck which discharges directly to the River Humber. Much of the area is underlain by the Frodingham Ironstone which is water bearing and is considered to be a minor aquifer. Drainage in this area has been complicated by opencast workings and dewatering. The original watercourse has been rerouted in many places.

The Lincolnshire Limestone is an important aquifer. Its ridge line generally marks the western boundary of the catchment. Although for the purposes of this report it has been considered as a single unit, it comprises a series of faulted limestones and clays. Its dip slope to the east has been heavily weathered and dissected by small watercourses cutting back into the outcrop. Much of the outcrop is overlain by sands and other superficial deposits.

Numerous watercourses emanating from the limestone edge drain onto the clay vale which forms the Ancholme valley. The clay vale is low lying and until recently would have been poorly drained and subject to tidal flooding.

The Chalk is an important major aquifer but most of the drainage from the Chalk is to the east of this catchment (Grimsby and Louth Catchments). Some spring flow does however originate from the edge of the Chalk and from the Spilsby Sandstone flowing westwards across the clay vale to the River Ancholme. The River Rase being the main tributary of the River Ancholme in particular is fed from several strong springs on the scarp slope of the Chalk.


AQUIFER OUTCROPS AND HYDROMETRIC DETAILS
KEY
CATCHMENT BOUNDARY
MAIN RIVER
TELEMETRY OUTPUT
YES NO
RIVER LEVEL
RIVER FLOW GAUGING STATION
RIVER FLOW CURRENT METER
BOREHOLE LEVEL
RAINGAUGES
TIDE LEVEL
SALINITY LEVEL
MAJOR AQUIFERS
LINCOLNSHIRE LIMESTONE
CHALK
SPILSBY SANDSTONE
River Humber
A
A
B
B
SCUNTHORPE
BRIGG
MARKET RASEN
NORTH
SCALE
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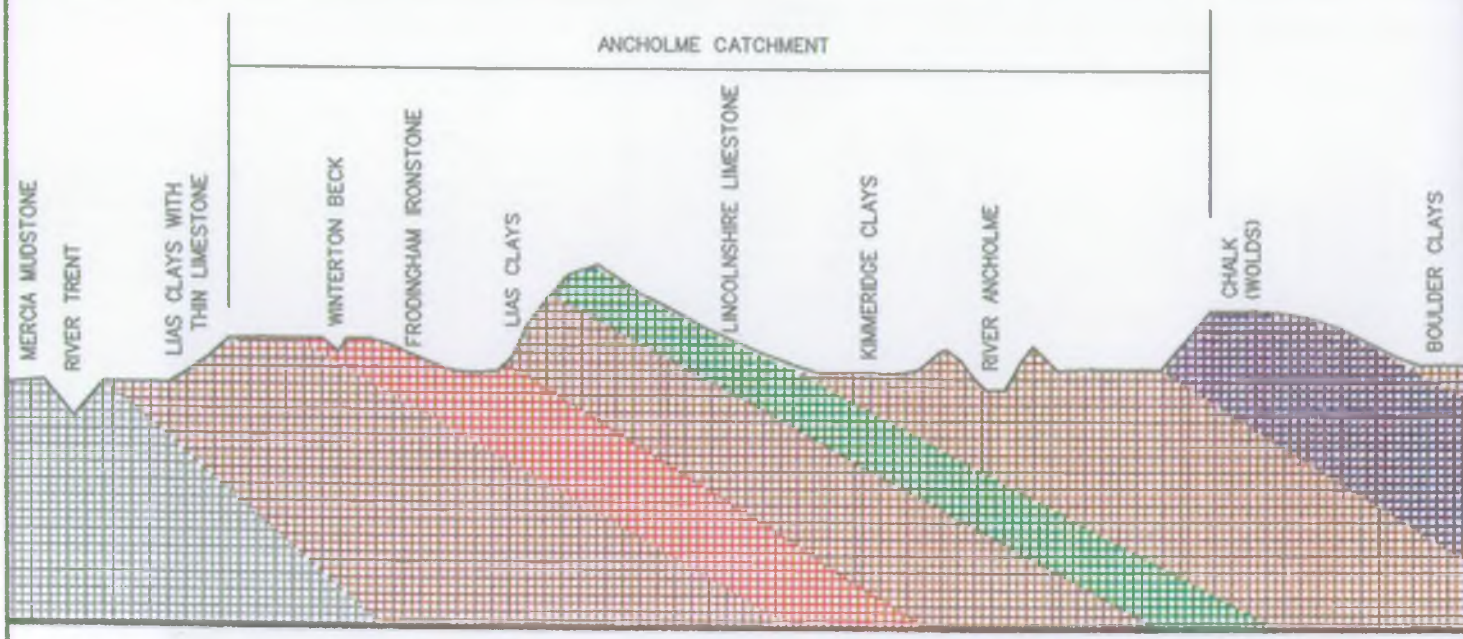
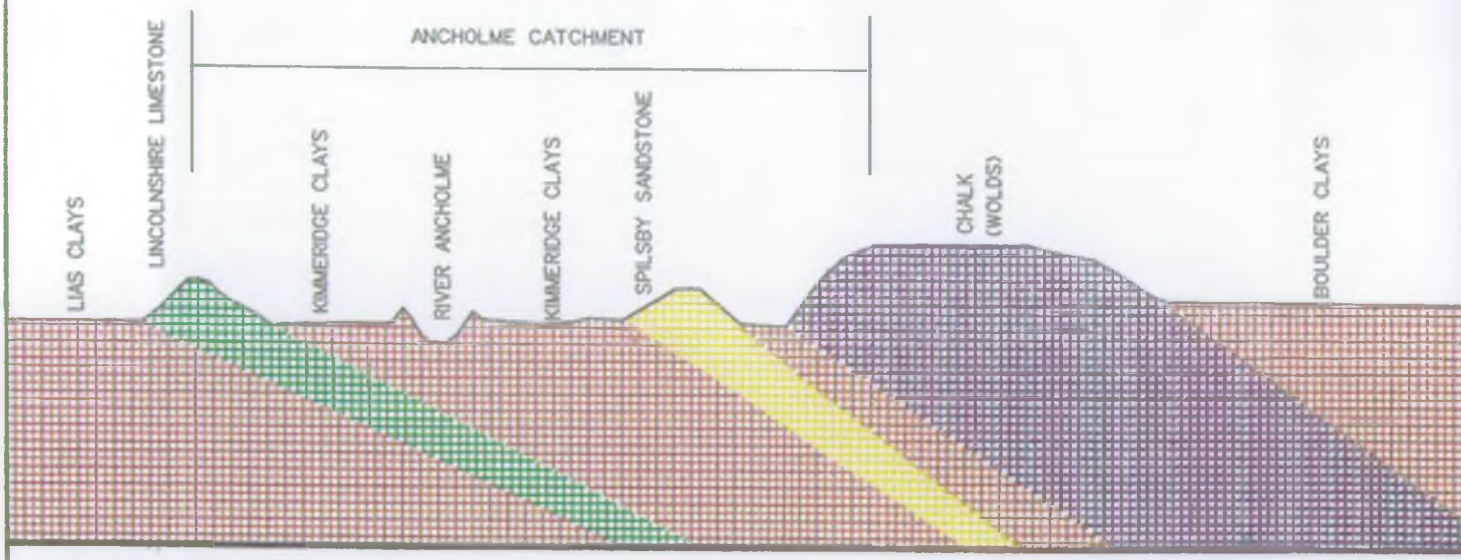
DIAGRAMATIC GEOLOGICAL CROSS SECTIONS



SECTION AA



SECTION BB

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ANCHOLME CATCHMENT MANAGEMENT PLAN
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2.6 HYDROMETRIC NETWORK

The NRA maintains and operates a network of hydrometric sites within the catchment to monitor rainfall, groundwater and river levels and flows.

Data from many of the sites are collected at regular intervals and key sites are linked to our regional telemetry system enabling live data to be automatically transmitted and retrieved from a central computer.

PRINCIPAL HYDROMETRIC SITES ARE SHOWN ON MAP NO. 2

Appendix 1 gives details of the current hydrometric network in the catchment.

Information from the network, which extends across all catchments, is used to assess, monitor and control the allocation of water resources. Within our flood defence function historical river flow data is used for design purposes and real time data is used to enable the NRA to carry out its flood warning function. Historical river flow data is used in the assessment procedure for setting Discharge Consents and real time data can be used in estimating travel times when dealing with and monitoring pollution incidents.

2.7 WATER RESOURCES

The Lincolnshire Limestone is the major aquifer in the catchment. Compared to the Lincolnshire Limestone to the south of Lincoln, it is generally thinner, contains more clay and is more heavily faulted. The aquifer dips more steeply to the east and yields less water than further south and across a narrower confined zone to the east of the outcrop. It however provides baseflow discharge to the River Ancholme and meets demands for public water supply, industrial agricultural and spray irrigation. The aquifer is now considered to be fully committed and no additional water can be licensed.

The main surface water resource in the catchment is the River Ancholme which can be augmented by transfers of water from the River Witham (which in turn may be transferred as necessary from the River Trent). This major river transfer scheme, owned and operated by the NRA and known as the Trent Witham Ancholme scheme (TWA) was completed in the mid 1970's. The scheme was principally designed to meet the growing demands for water (both water supplies and industrial supplies) along the South Humber Bank (Grimsby Catchment) which could not be met from increased abstraction from the chalk aquifer.

The major abstractors from the River Ancholme are Anglian Water Services, Brigg Power station and British Steel. The NRA can currently consider new demands direct from the Ancholme, although they would be subject to controls and occasional restrictions.

Although winter abstraction will be considered favourably within the catchment, no further direct abstraction can be permitted from minor surface watercourses in summer.

Most of the water currently licensed from the catchment is surface water, based on the NRA's Trent Witham Ancholme Scheme. The Ancholme is a prime source of water for the town of Scunthorpe (outside the catchment) and the steel works.

The effective and efficient operation of the TWA scheme is key to meeting abstraction and in river needs for water.

2.8 WATER QUALITY

Water quality in the Ancholme Catchment is generally of good to fair quality. In the farther upper reaches of the Ancholme itself, together with its tributaries, quality is good but as the river flows slowly through the fertile Ancholme valley, eutrophic effects generally reduce quality to fair, particularly during periods of low summer flow. The ability to augment the flow in the river during these periods helps to reduce the impact of eutrophication and also assists in controlling saline ingress into the system through the navigation/tidal structure at South Ferriby.

2.8.1 Surface Water

River Quality Surveys carried out for the years 1988-94 indicate that water quality within the Catchment is improving. NRA staff take approximately 240 samples per year at 19 freshwater monitoring sites for quality assessment and statutory purposes.

Water quality has to be protected for a range of water uses, particularly the Anglian Water supply intake on the River Ancholme at Cadney. Water in the catchment is also extensively used for spray irrigation and maintaining high quality fisheries. Livestock watering and industrial water supplies also have to be protected.

Being a largely rural catchment, the main influence on water quality is agriculture, particularly arable farming. This has resulted in high Nitrate levels being observed, exceeding the EC Surface Water Directive (75/440/EEC) and Nitrate Directive (91/676/EEC) standards. The two major towns in the Catchment, Market Rasen (R. Rase) and Brigg (R. Ancholme) do not have a major impact on water quality. However industrial sites, particularly in the North and West of the Catchment do impact locally on some of the smaller streams.

2.8.2 Groundwater

The quality of groundwater in the catchment is generally good, however high nitrate levels are found in some groundwaters. Groundwater quality is routinely monitored by taking samples from boreholes drilled into the Lincolnshire Limestone or from spring sources.

The Catchment is bounded by the Lincolnshire limestone aquifer to the West and the Northern Chalk aquifer to the East. Both are used as public water supplies by Anglian Water Services. Protection of these supplies is important and the NRA uses its Groundwater Protection Policy to influence development within these area and to minimise the risk of groundwater pollution.

The intensive open cast mining of iron ore in the North West of the Catchment has left behind a number of holes or 'gullets' that are now being used as landfill sites for waste disposal. Leachate, produced by the decomposition of waste is highly polluting if it enters controlled waters.

2.9 FLOOD DEFENCE

2.9.1 Tidal Defences

The catchment has 11 kilometres of tidal defences which protect approximately 80 square kilometres of predominantly agricultural land and the town of Brigg which lie below the highest astronomical tide levels of 5.0 metres AOD.

2.9.2 Fluvial Defences

The main arterial watercourses for this catchment, the Ancholme, Land Drain, West Drain and Winterton Beck are embanked to prevent flooding of low lying land. These watercourses carry highland waters from the whole of the catchment to discharge to the Humber through sluices designed to prevent the influx of tidal waters. The flood capacity of some lengths of "Main" river, notably along the Ancholme, some of its tributaries and the River Rase, are inadequate for the land use protected.

The system of flood protection/land drainage maintained by the NRA is complemented by an extensive network of drainage channels and pumping stations maintained by Ancholme Internal Drainage Board. The importance of the agricultural industry to this area makes the effectiveness of both fluvial defences and land drainage a key feature of this plan.

2.10 FISHERIES

This Catchment is dominated by the River Ancholme which demonstrates a fish fauna typical of a lowland watercourse. Fish species found during survey work includes: common bream, roach, pike, perch and eel, with some upper rivers containing: brown trout, stoneloach and dace.

Routine fisheries surveys are carried out throughout this system at 3 year intervals. This work has demonstrated that at present the River Ancholme supports a good fish biomass in the main river section.The fisheries supported by the main River Ancholme are used extensively by anglers who benefit from this resource.

On River Rase habitat appears to be a limiting factor and scope for improvement along degraded sections exists. Such work might include the reinstatement of riffles and flow deflectors. Other watercourses in the catchment support poor fish populations, namely the Winterton Beck, West Drain and the Land Drain - the reasons for this are unknown.

Within the catchment there are other smaller watercourses that either combine with the main River Ancholme or exist as separate rivers discharging to the Humber directly.

For the future maintenance of this fishery it is essential that further improvements are undertaken to develop the resource.

2.11 RECREATION

Recreation throughout this catchment is actively undertaken by both local people and visitors to the area.

Leisure pursuits on the River Ancholme include: angling, rowing, boating, canoeing, and walking. Along many riverbank sections, good footpath access is available which improves quiet recreational enjoyment of this river.

Recreational use on the river is managed by the Ancholme Users Group which represents most of the recreational interests on the river. However recreational demand on the river is rising and requires co-ordination to satisfy demands and exploit opportunities.

2.12 CONSERVATION

Within the low lying areas of this catchment, historical modifications to the rivers and streams for navigation and land drainage purposes have resulted in a uniform channel structure and subsequently the loss of diverse plant communities and natural fenland habitats. Eutrophication, maintenance of channelised rivers and lack of natural riverside margins are further constraints on the conservation interests within this catchment.

In upland areas, e.g. River Rase, important invertebrate communities are supported by short riffle and pool systems. Springs along the chalk and limestone edges are also of high conservation value, notably Broughton Alder Wood and Springs which is designated as a Site of Special Scientific Interest (SSSI).

There are 17 SSSIs (including the Humber), 3 Country Trust Nature Reserves and 28 Sites of Nature Conservation Importance (SNCI) within the catchment.

This catchment contains a range of archaeological interests, including prehistoric remains at Risby, Ermine Street (the Roman road) and its associated sites; and the more recent bridges and locks of the River Ancholme.

2.13 NAVIGATION

Boats have travelled on the River Ancholme for many hundreds of years, with works to improve the navigation being recorded back at the end of the 13th century. In the past the Ancholme represented an important route for the transportation of cargo, linking the catchment with the industrial towns of Yorkshire and beyond. Today, navigation is almost exclusively recreational with over 200 boats registered on the system. The NRA is the Navigation Authority for the Ancholme and aims to improve and maintain the navigation and its facilities. The NRA owns and operates South Ferriby Lock which is the key navigation structure, which links the Ancholme with the River Humber. The Ancholme is a 'safe haven' for craft on the Humber.

South Ferriby is the only location on the river with sanitary facilities dedicated to navigation. Boat users feel that the provision of facilities and services are inadequate on the Ancholme.

3.0 CATCHMENT USES

3.1 WATER RESOURCES

3.1.1 General

Water is abstracted for use for the public water supply, general agriculture, domestic, spray irrigation and industrial purposes. All major abstractions of water whether from groundwaters, surface waters or tidal waters are required to be licensed by the NRA to ensure a balanced and sustainable use of resources.

The total licensed quantity within the catchment is 49,734 tcma of which 40,062 tcma is surface water and 9,672 tcma is groundwater. This is allocated within a total of 174 licences of which 102 are surface water and 72 are groundwater. Most of the abstraction licences in the catchment are for spray irrigation, yet abstraction for public water supply accounts for three quarters of all licensed and actual abstraction.

In summary the principal licensed use of water within the catchment is for public water supply which is dominated by the Anglian Water Services abstraction at Cadney. This abstraction represents one of the two major surface water imports to the adjacent Grimsby catchment.

A breakdown of licensed abstractions and actual abstractions for 1990 (dry year) and 1994 (average year) is given below. Figure 2 illustrates these statistics graphically. For the purpose of this report licensed abstractions have been taken at April 1995.

TABLE 2.1

SUMMARY OF LICENSED WATER ABSTRACTION (TCM) AT APRIL 1995

USE	SURFACE WATER (SW)		GROUNDWATER (GW)		TOTALS		TOTAL%	
	NO	TCMA	NO	TCMA	NO	TCMA	OF NO	OF TCMA
PUBLIC WATER SUPPLY (PWS)	1	31,000	6	5,803	7	36,803	4%	74%
INDUSTRIAL (IND)	4	6,539	4	2,093	8	8,632	5%	17%
AGRICULTURAL (AGRIC)	0	0	36	157	36	157	21%	1%
SPRAY IRRIGATION (SI)	97	2,523	26	1,619	123	4,142	70%	8%
TOTAL	102	40,062	72	9,672	174	49,734	100%	100%

WATER RESOURCES ABSTRACTION LICENCES

Number of licences

USE	No. OF LICENCES	% OF TOTAL
PWS	7	4
INDUSTRIAL	8	5
AGRICULTURAL	36	21
SPRAY IRRIGAT'	123	70
TOTAL	174	100

Licensed abstraction

USE	TCMA	% OF TOTAL
PWS	36,803	74
INDUSTRIAL	8,632	17
AGRICULTURAL	157	1
SPRAY IRRIGAT'	4,142	8
TOTAL	49,734	100

Actual abstraction 1994

USE	TCMA	% OF TOTAL
PWS	16,408	75
INDUSTRIAL	4,102	19
AGRICULTURAL	79	1
SPRAY IRRIGAT'	1,240	5
TOTAL	21,829	100

National Rivers Authority

Anglian Region
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ANCHOLME CATCHMENT MANAGEMENT PLAN
JANUARY 1996 FIG NUMBER 2

TABLE 2.2

SUMMARY OF ACTUAL ABSTRACTION (1990 AND 1994)

	1990			1994			1994	
	VOLUME ABSTRACTED - THOUSAND CUBIC METRES						% OF TOTAL (ALL USES)	% OF LICENSED (INDIVIDUAL USE)
	SW	GW	TOTAL	SW	GW	TOTAL		
PWS	15,486	2,653	18,139	13,301	3,107	16,408	75%	45%
IND	1,205	504	1,709	3,648	454	4,102	19%	47%
AGRIC	0	79	79	0	79	79	1%	50%
SI	572	878	1,450	601	641	1,240	5%	30%
TOTAL	17,263	4,114	21,377	17,500	4,281	21,829	100%	44%

THE LOCATION OF ABSTRACTIONS ARE SHOWN ON MAP NO. 3

3.1.2 Potable Water Supply - Surface Water

General

Water may be abstracted for use from surface water sources, ie rivers and springs, for domestic water supply purposes (ie drinking, washing etc). Surface water is a key source of water for public water supplies and industry in general.

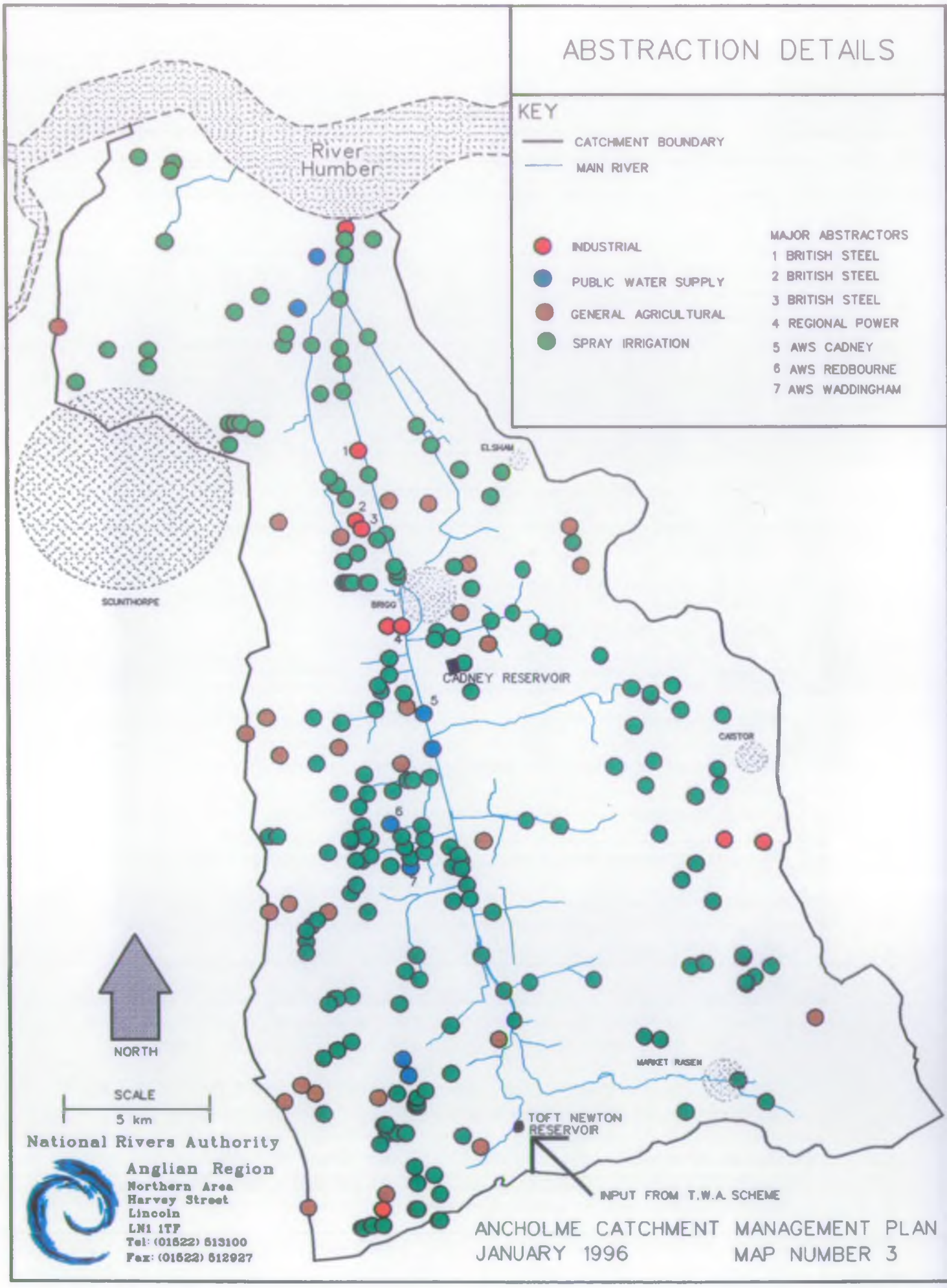
Local Perspective

Within the catchment there is one major strategic surface water abstraction for public water supply from the River Ancholme at Cadney. The size of this abstraction dominates all other abstractions within the catchment. Water abstracted by Anglian Water Services at Cadney can be stored in Cadney Carrs reservoir nearby and is treated at Elsham just outside the catchment to the east.

Water abstracted at Cadney can be used for supplies locally within the catchment, to the west in Scunthorpe and a major part of the abstraction is used for industrial and public water supply use along the Humberbank and Grimsby areas.

The abstraction at Cadney is dependent upon the support of flow in the River Ancholme via the NRA's Trent-Witham-Ancholme transfer scheme.

The water supply system operated by Anglian Water Services can be flexibly operated to vary the quantities of surface water put into supply, from the surface water at Cadney and the groundwaters from within the catchment.


ABSTRACTION DETAILS
KEY
CATCHMENT BOUNDARY
MAIN RIVER
INDUSTRIAL
PUBLIC WATER SUPPLY
GENERAL AGRICULTURAL
SPRAY IRRIGATION
MAJOR ABSTRACTORS
1 BRITISH STEEL
2 BRITISH STEEL
3 BRITISH STEEL
4 REGIONAL POWER
5 AWS CADNEY
6 AWS REDBOURNE
7 AWS WADDINGHAM
River Humber
SCUNTHORPE
ELSHAM
BRIGG
CADNEY RESERVOIR
CASTOR
MARKET RASEN
TOFT NEWTON RESERVOIR
INPUT FROM T.W.A. SCHEME
NORTH
SCALE
5 km
National Rivers Authority
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The surface water abstraction at Cadney accounts for 62% of the total quantity licensed for all uses in the catchment. The total licensed abstraction for PWS is 36,803 tcma which accounts for 74% of total licensed abstraction in the catchment.

In 1990 (drought year) and 1994 actual abstractions at Cadney accounted for 72% and 61% respectively of all abstraction within the catchment.

3.1.3 Potable Water Supply - Groundwater

General

Water is abstracted from groundwater sources (boreholes) for domestic water supply purposes (ie drinking, washing etc). Groundwater abstracted from the limestone is important to meet local rural demand. All such abstractions are controlled by abstraction licences issued by the NRA.

Local Perspective

There are 6 groundwater sources licensed for public water supply use in the catchment. Water is abstracted from boreholes in the local limestone aquifer. It is of good quality and generally requires little treatment. This water is used primarily to meet local domestic demand within the catchment. Water abstracted from the limestone sources in the Winterton area can be used in conjunction with surface water from the Ancholme to meet demand in the Scunthorpe area.

The total licensed abstraction for public water supply use from groundwater within the catchment is 5803 tcma, from sources at Winterton, Waddingham, Redbourne, Hibaldstow and Glentham. The 6 sources licensed for public water supply account for 60% of the groundwater licensed in the catchment.

In 1994 abstraction for this use was approximately 54% of the licensed quantity and represented 73% of all groundwater abstraction in the catchment.

3.2 INDUSTRIAL ABSTRACTION

General

Water is abstracted from ground and surface water sources for industrial purposes. All such abstractions are controlled by abstraction licences issued by the NRA.

Local Perspective

There are 8 industrial abstractions within the catchment, 4 surface water and 4 groundwater, amounting to 8,632 tcma or 17% of total licensed abstraction within the catchment.

Abstraction from the River Ancholme by British Steel at Worlaby and Regional Power Generators at Brigg account for 70% of the licensed Industrial abstraction in the catchment.

Abstraction by Anglian Water Services at Cadney also provides water to industrial premises on the Humberbank and Scunthorpe outside the catchment. Anglian Water Services abstraction at Cadney is counted as a Public Water Supply abstraction within this report.

Actual abstraction in 1994 was 47% of licensed industrial abstraction and 19% of total actual abstraction in that year.

3.3 AGRICULTURAL ABSTRACTION AND LIVESTOCK WATERING

General

Water is abstracted from ground and surface waters for agricultural use including spray irrigation and general agricultural use (stock watering, crop spraying etc). All uses, except general agricultural abstractions of less than 20 cubic metres per day from surface waters, require a licence.

Local Perspective

Spray Irrigation:

Much of the land in this catchment benefits from spray irrigation and the availability of water for certain crops such as potatoes and beet is a critical factor in determining their yield and profitability.

The total quantity licensed for spray irrigation is 4,142 tcma which is 8% of total licensed abstraction in the catchment although in number the 123 licences (the majority being surface water) account for 70% of the total number of licences in the catchment.

In 1994 actual abstraction was 30% of licensed abstraction for spray irrigation and 5% of total actual abstraction in the catchment in that year. Licences for spray irrigation are generally granted for the period April to October and the greatest usage of licences occurs in the May to July period. Maximum demand generally occurs when available water resources are at a minimum.

The only potential sources for which spray irrigation can now be considered are direct abstraction from the River Ancholme (or rivers which back up from the Ancholme) or winter storage. Several large winter storage schemes have recently been developed within the catchment.

General Agriculture:

There are 36 groundwater licences (21% of total in catchment) but they account for less than 1% of the total licensed quantity, totalling only 157 tcma.

Livestock Watering:

The majority of streams and drains in the catchment have a potential to be used for livestock watering. For those watercourses which are monitored for their quality and which have this identified use, water quality objectives under development will provide standards to protect their use.

3.4 EFFLUENT DISPOSAL

Watercourses in the catchment receive a range of both treated and untreated effluent. At certain times of the year effluent returns can make up a significant proportion of river flow.

INDUSTRIAL DISCHARGE SOURCES AND SEWAGE TREATMENT WORKS IN THE CATCHMENT ARE SHOWN ON MAP NO. 4

3.4.1 Treated Effluent

Treated effluent sources include those sewage treatment works operated by the Water Undertaker, in this Catchment AWS; those operated by private individuals, industrial companies and district councils.

The conditions which must be complied with by those discharging effluent to watercourses are specified in consents issued by both the NRA and Her Majesty's Inspectorate of Pollution.

Consents are calculated taking into account upstream water quality and dilution available in the receiving watercourse. Consents are designed to ensure that downstream water quality remains acceptable for its many uses and compliant with prescribed water quality standards.

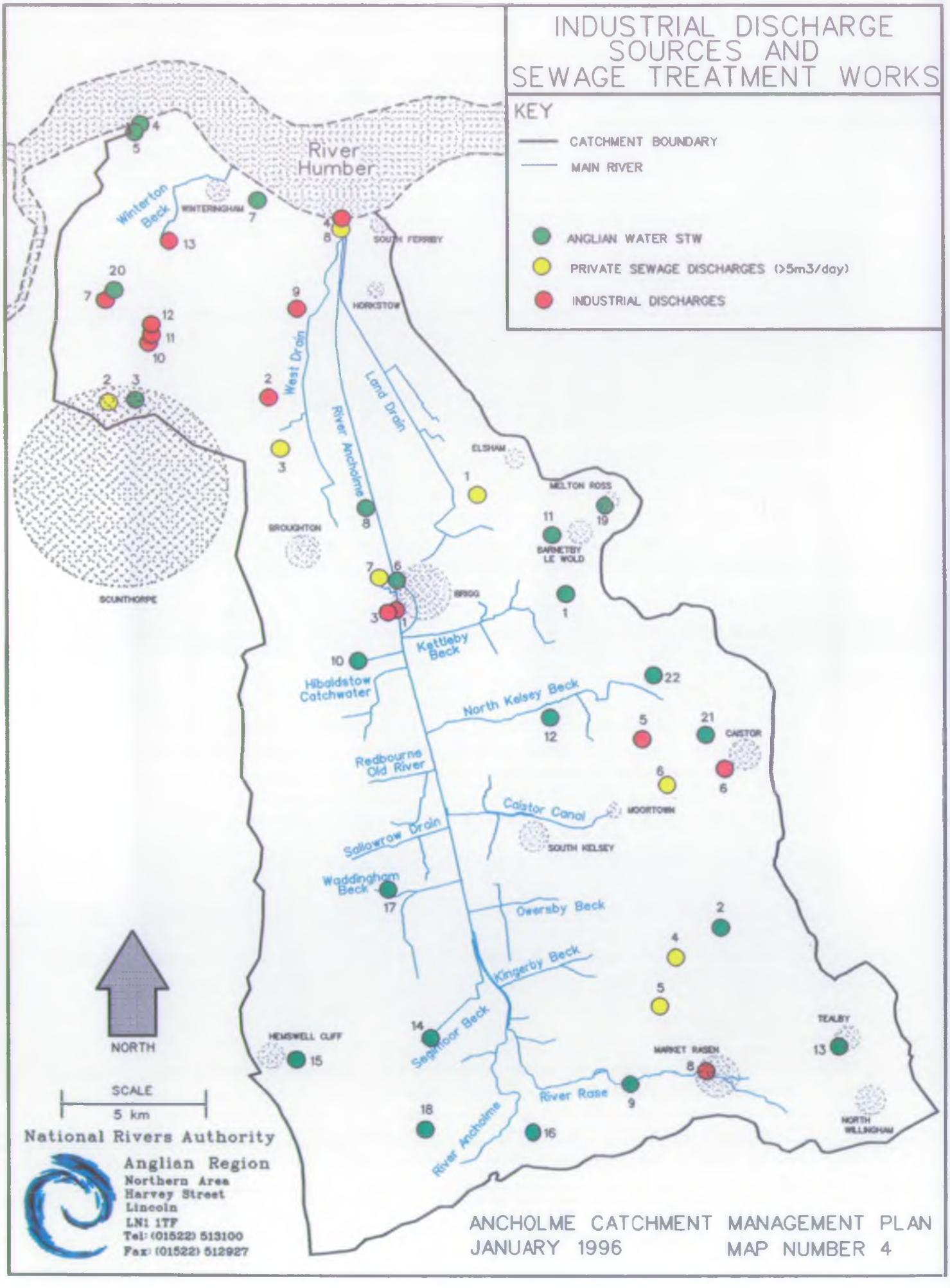
There are 22 Anglian Water sewage treatment works in the Ancholme Catchment. In addition, there are 18 sewage treatment works operated by private individuals, companies and local Councils, 8 of which discharge > $5m^3$/day.

Trade effluent from industrial areas and principal towns in the Catchment are usually treated at sewage treatment works operated by Anglian Water Services. However, 13 trade effluent discharges are made, after treatment, to controlled waters with the consent of the National Rivers Authority

3.4.2 Untreated Effluent

Untreated effluent sources include those discharges from consented emergency and storm water overflows from sewerage systems.

Emergency overflows occur due to electrical or mechanical breakdown of pumps which transfer sewage to the sewage treatment works.


INDUSTRIAL DISCHARGE SOURCES AND SEWAGE TREATMENT WORKS
KEY
CATCHMENT BOUNDARY
MAIN RIVER
ANGLIAN WATER STW
PRIVATE SEWAGE DISCHARGES (>5m3/day)
INDUSTRIAL DISCHARGES
River Humber
Winterton Beck
WINTERINGHAM
SOUTH FERRIBY
HORKSTOW
West Drain
River Ancholme
Land Drain
ELSHAM
MELTON ROSS
BROUGHTON
BARNETBY LE WOLD
SCUNTHORPE
BRIGG
Kettleby Beck
Hibaldstow Catchwater
North Kelsey Beck
Redbourne Old River
CAISTOR
Caistor Canal
MOORTOWN
SOUTH KELSEY
Sallowrow Drain
Waddingham Beck
Owersby Beck
Kingerby Beck
Snelmoor Beck
HEMSWELL CLIFF
MARKET RASEN
TEALBY
River Rase
River Ancholme
NORTH WILLINGHAM
NORTH
SCALE
5 km
National Rivers Authority
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ANGLIAN WATER STW

1 BIGBY
2 CLAXBY
3 DRAGONBY
4 WHITTON (N) SEPTIC TANK
5 WHITTON
6 BRIGG
7 WINTERINGHAM
8 BROUGHTON
9 MARKET RASEN
10 HIBALDSTOW
11 BARNETBY
12 NORTH KELSEY
13 TEALBY
14 GLENTHAM
15 RAF HEMSWELL
16 FALDINGWORTH MOD
17 WADDINGHAM
18 OWMBY
19 MELTON ROSS
20 THEALBY
21 CAISTOR
22 GRASBY

PRIVATE SEWAGE DISCHARGES

1 ELSHAM GOLF CLUB
2 GYPSY SITE CONESBY QUARRY
3 HAVERHOLME NURSING HOME
4 CHERRY VALLEY HATCHERY
5 HORSEWORLD HILL HOUSE
6 NETTLETON MANOR NURSING HOME
7 CASTLETHORPE HALL NURSING HOME
8 RUGBY CEMENT

INDUSTRIAL DISCHARGES

1 REGIONAL POWER
2 BRITISH STEEL
3 BRITISH SUGAR
4 RUGBY CEMENT
5 CHERRY VALLEY LAGOON
6 CHERRY VALLEY FARMS
7 THEALBY HALL FARM
8 RPC CONTAINERS
9 WINTERTON HOLMES
10 ROXBY LANDFILL 1 SOUTH
11 ROXBY LANDFILL 2
12 ROXBY LANDFILL 1 NORTH
13 WINTERTON LANDFILL SITE

Storm water overflows are constructed on foul drainage systems receiving surface water in addition to sewage. A tremendous volume of water enters the common sewer in times of very wet weather, and it would be impractical to construct sewers large enough to convey all this water to the sewage works. Overflows are therefore constructed to allow dilute sewage effluent in storm conditions to discharge direct to the watercourse when flows within the foul drainage systems reach a certain level. These overflows are screened to prevent gross solids entering the watercourse.

In the past it was common practice to set storm sewage overflows at 6 times dry weather flow as it was considered that at this dilution the discharge would not impact on the receiving watercourses. In most cases this is sufficient however there are more sophisticated techniques available, including computer modelling which can be used when the overflow is in a more sensitive area.

3.4.3 Septic Tanks

In rural areas, premises are often served by septic tanks, these however, provide insufficient treatment to allow the effluent to be discharged to watercourse. For new development the NRA, as a consultee in the Planning process, where appropriate, asks for conditions to be added to planning decisions, stipulating septic tank effluent be discharged to an adequate soakaway to prevent pollution of the water environment.

Many houses in the catchment have septic tanks which, on the whole, work adequately. However, localised pollution does occur where septic tanks are wrongly connected to watercourses or where soakaway systems are insufficient.

3.5 WASTE DISPOSAL SITES

The use of land for a wide range of waste disposal and recycling operations, eg landfill sites, waste transfer stations, incinerators, scrap yards etc poses a threat to the quality of both groundwater and surface water. Waste management is enforced by both Lincolnshire and Humberside County Councils, the Waste Regulation Authorities (WRAs) in this Catchment. Waste management licences, issued under the Environmental Protection Act 1990, ensure waste disposal sites are controlled during both operational and post-closure phases. For those sites closed post May 1994 the surrender of an Operators Licence is only permissable when a site no longer poses a risk of pollution.

There is a potential for pollution from all waste disposal operations, but of greatest concern to the NRA is landfill. Where waste is disposed of in this manner, there is a risk of leachate escaping and polluting ground water and surface water.

In addition to disposal of wastes at specific sites, sewage sludge and other industrial wastes, such as dairy, food processing, abattoir, septic tank and cess pit wastes can be spread onto agricultural land. Operators are required to notify the Waste Regulation Authorities of their intention to spread waste on particular sites and may do so without a licence if spreading is of agricultural benefit without causing an environmental hazard. Operators should always follow MAFF's 'Code of Good Agricultural Practice for the Protection of Water'. This code is at present voluntary.

As a statutory consultee to the Waste Regulatory Authorities (WRAs) the NRA carries out its duty to protect the water environment from the adverse impacts of waste disposal activities. In 1992 the NRA published its 'Policy and Practice for the Protection of Groundwater'. Implementation of this policy seeks to discourage waste disposal activities where groundwater is most vulnerable to pollution.

In the past, landfilling has been undertaken at unlined sites following the 'dilute and disperse' principle. This assumed that any leachate generated was retained in close proximity to the site for sufficient time to allow natural degradation and/or dilution to occur. Such sites, where leachate migration may prove a threat to ground or surface waters, are identified and monitored, and appropriate action is taken where necessary.

New landfill sites, taking leachate generating wastes, are constructed as fully engineered containment sites, using either natural or artificial liners. To minimise leachate production the landfill sites are filled in successive cells, thereby exposing the minimum amount of waste to rainfall. In addition liquid waste inputs are strictly controlled. The leachate depth within the site is also kept to a minimum. When landfilling has been completed, the site is capped with an engineered low permeability material to further minimise infiltration of rainwater.

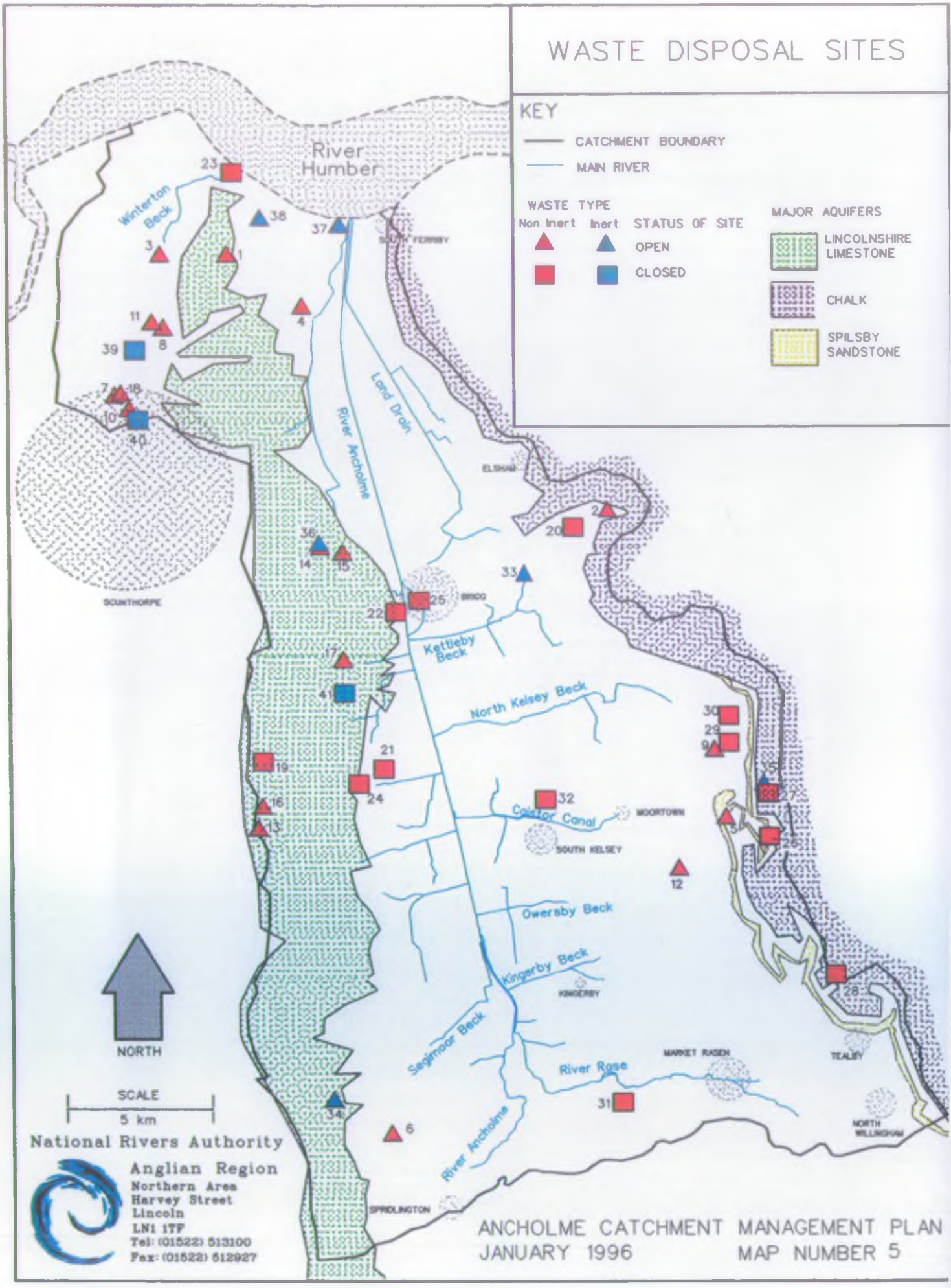
Waste Disposal Sites include landfill sites, scrapyards, transfer stations and civic amenity sites. There are 41 waste disposal sites in the Ancholme Catchment, of which 25 are landfill sites. Leachate generating wastes have been deposited in 17 of the landfill sites and it is these sites which pose the greatest risk of pollution.

Of the 41 waste disposal sites in the catchment 24 are currently operational and licensed by the WRA. The WRA regularly inspect these sites to ensure they are compliant with their licences.

In the western part of the catchment ironstone was mined for steel manufacture. This has left a number of ironstone gullets which are still being infilled with wastes.

Monitoring of landfill sites is undertaken by the site operator, as required by their licence. The Waste Regulation Authority carries out audit monitoring.

WASTE DISPOSAL SITES IN THE CATCHMENT ARE SHOWN ON MAP NO.5


WASTE DISPOSAL SITES
KEY
CATCHMENT BOUNDARY
MAIN RIVER
WASTE TYPE
Non Inert
Inert
STATUS OF SITE
OPEN
CLOSED
MAJOR AQUIFERS
LINCOLNSHIRE LIMESTONE
CHALK
SPILSBY SANDSTONE
River Humber
Winterton Beck
Land Drain
River Ancholme
Kettleby Beck
North Kelsey Beck
Caistor Canal
Owersby Beck
Kingerby Beck
Segmoor Beck
River Rase
SCUNTHORPE
SOUTH FERRIBY
ELSHAM
BRIGG
MOORTOWN
SOUTH KELSEY
KINGERBY
MARKET RASEN
TEALBY
NORTH WILLINGHAM
SPRIDLINGTON
NORTH
SCALE
5 km
National Rivers Authority
Anglian Region
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WASTE DISPOSAL SITES

		STATUS OF SITE	TYPE OF SITE
NON INERT			
1	CIVIC AMENITY SITE WINTERTON	OPEN	HWDS
2	CIVIC AMENITY SITE BARNETBY LE WOLD	OPEN	HWDS
3	WINTERTON LANDFILL SITE	OPEN	LF
4	AWS SLUDGE LAGOONS	OPEN	LAGOONS
5	WOODS HILL	OPEN	LF
6	OWMBY CLIFF FARM	OPEN	TS
7	CONESBY QUARRY	OPEN	LF
8	ROXBY GULLET LANDFILL	OPEN	LF
9	NTH KELSEY RD	OPEN	SY
10	DRAGONBY LANDFILL SITE	OPEN	LF
11	ROXBY SIDINGS	OPEN	TS
12	AIR MINISTRY SITE	OPEN	SY
13	REDBOURNE MERE	OPEN	HWDS
14	6 HIGH ST BROUGHTON	OPEN	SY
15	CIVIC AMENITY SITE BROUGHTON	OPEN	HWDS
16	KIRTON LINDSEY	OPEN	SY
17	STATION YARD SCAWBY	OPEN	SY
18	CONESBY QUARRY	OPEN	LF
19	KIRTON LINDSEY QUARRY	CLOSED	LF
20	BARNETBY STATION	CLOSED	LF
21	HIBALDSTOW AIRFIELD	CLOSED	TS
22	BRITISH SUGAR	CLOSED	LF
23	WINTERINGHAM HAVEN	CLOSED	LF
24	CIVIC AMENITY SITE REDBOURNE	CLOSED	HWDS
25	JAMES ST YARD	CLOSED	SY
26	NETTLETON BOTTOM QUARRY	CLOSED	LF
27	MANSGATE HILL	CLOSED	LF
28	WALESBY TOP	CLOSED	LF
29	SANDBRASS	CLOSED	LF
30	BRIGG ROAD	CLOSED	LF
31	NORMANBY BY SPITAL	CLOSED	LF
32	NORTH KELSEY	CLOSED	LF
INERT			
33	KETTLEBY HOUSE FARM GRAVEL QUARRY	OPEN	LF
34	CANEBY HALL	OPEN	TS
35	MANSGATE QUARRY	OPEN	LF
36	TOWN HILL	OPEN	LF
37	RUGBY CEMENT	OPEN	LF
38	EASTFIELD FARM	OPEN	LF
39	BAGMOOR LANE REFUSE SITE	CLOSED	LF
40	DRAGONBY SITE	CLOSED	LF
41	SCAWBY STATION	CLOSED	LF

HWDS=Household Waste Disposal Site
TS=Transfer Station
LF=Landfill Site
SY=Scrape Yard

3.6 FLOOD DEFENCE

3.6.1 General

Flood defences are constructed to provide effective defence for people and property against flooding from rivers and the sea. Flooding from the sea and tidal waters is usually threatened as a consequence of extreme climatic conditions, such as the coincidence of low atmospheric conditions - which raise tide levels, and high winds. Fluvial flooding is likely to result from intense rainfall or when the discharge to tidal waters is restricted by the tidal cycle.

The standard of flood defence provided depends on the type of land being protected and whether it is being protected from tidal or fluvial flooding. Urban flood defences are usually built to a higher standard than those for agricultural land.

Responsibility for the maintenance of watercourses to accommodate land drainage normally rests, in the first instance, with the riparian landowner, however, under the Water Resources Act 1991, the NRA exercises a general supervision over all matters relating to flood defence in England and Wales. It has powers to control obstructive works on any watercourse. Internal Drainage Boards (IDBs) have similar powers for watercourses within their areas.

Main arterial watercourses are formally designated as the "Statutory Main River". On Main Rivers, the NRA has permissive powers to carry out works and control the actions of others. Any proposal that could interfere with the bed or banks or obstruct the flow in the river requires formal consent from the NRA.

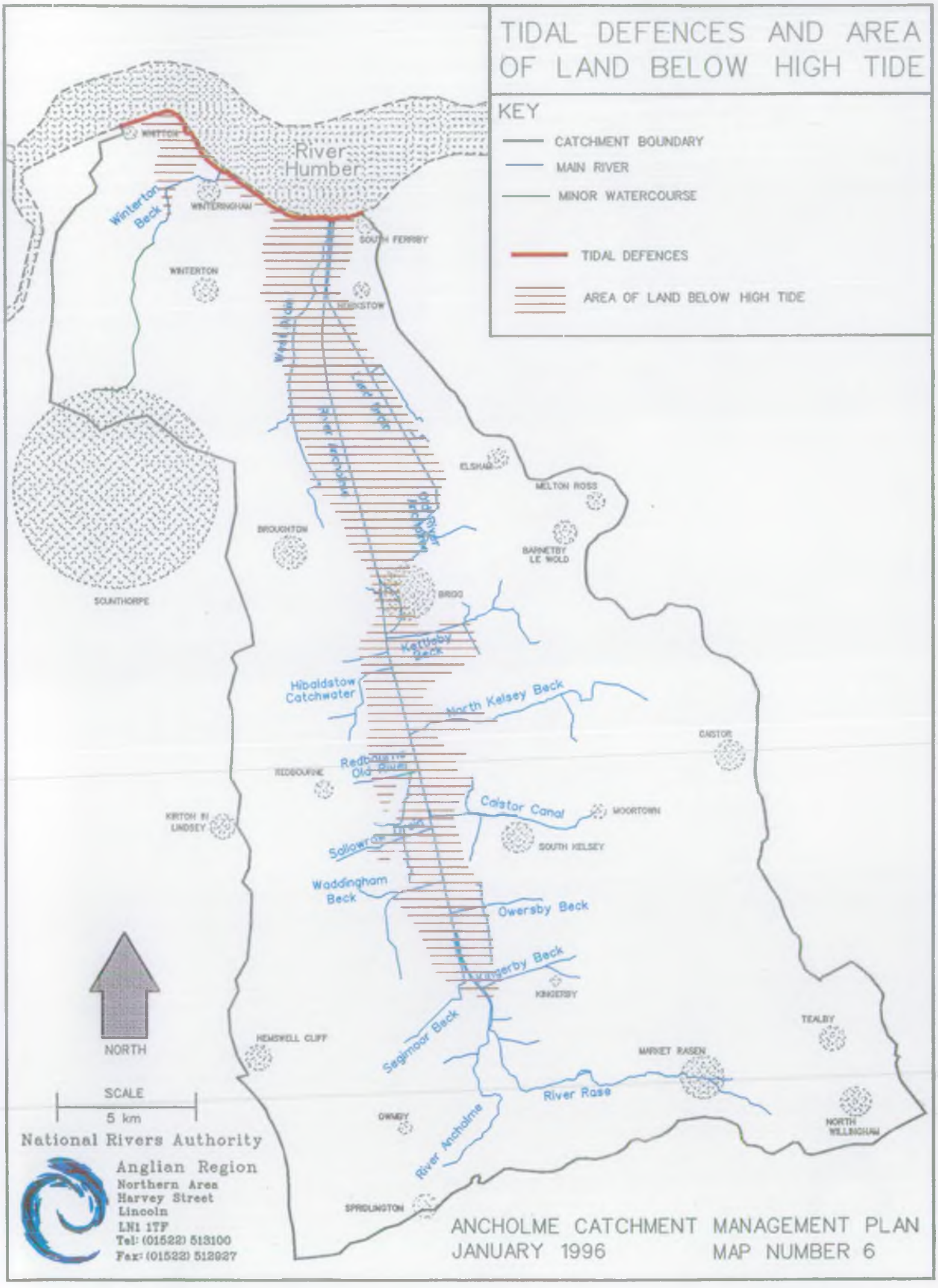
The nature of works carried out for flood defence sometimes conflicts with other Catchment uses, for example proposed improvement works to tidal defences may encroach upon valuable wildlife habitat. The NRA seeks to reduce conflicts by undertaking consultation with other users to ensure that such works are executed with minimum effect to the environment and that where possible environmental enhancements are made.

TIDAL DEFENCES AND THE AREA OF LAND BELOW HIGH TIDE LEVELS ARE SHOWN ON MAP NO. 6
INTERNAL DRAINAGE BOARD DETAILS ARE SHOWN ON MAP NO. 7

3.6.2 Tidal Defences

Substantial tidal defences have been constructed and maintained along the south bank of the River Humber between Ferriby Cliff and Whitton. These defences protect the lower lying areas of the Catchment against tidal inundation.

Where watercourses discharge into the Humber they are provided with outfall structures to prevent tidal waters entering the freshwater system. The outfall for the Ancholme at South Ferriby was first constructed in 1635 prior to which the connection between the Humber and the Ancholme was open.


TIDAL DEFENCES AND AREA OF LAND BELOW HIGH TIDE
KEY
CATCHMENT BOUNDARY
MAIN RIVER
MINOR WATERCOURSE
TIDAL DEFENCES
AREA OF LAND BELOW HIGH TIDE
River Humber
WINTERTON
WINTERINGHAM
Winterton Beck
SOUTH FERRIBY
WORLABY
ELSHAM
MELTON ROSS
BROUGHTON
BARNETBY LE WOLD
SOUTHORPE
BRIGG
Kettleby Beck
Hibaldstow Catchwater
North Kelsey Beck
CASTOR
REDBOURNE
Redbourne Old River
Caistor Canal
MOORTOWN
KIRTON IN LINDSEY
SOUTH KELSEY
Waddingham Beck
Owersby Beck
KINGERBY
TEALBY
HEMSWELL CLIFF
MARKET RASEN
Seglingar Beck
River Rase
OWMBY
NORTH WILLINGHAM
River Ancholme
SPRIDLINGTON
NORTH
SCALE
5 km
National Rivers Authority
Anglian Region
Northern Area
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Lincoln
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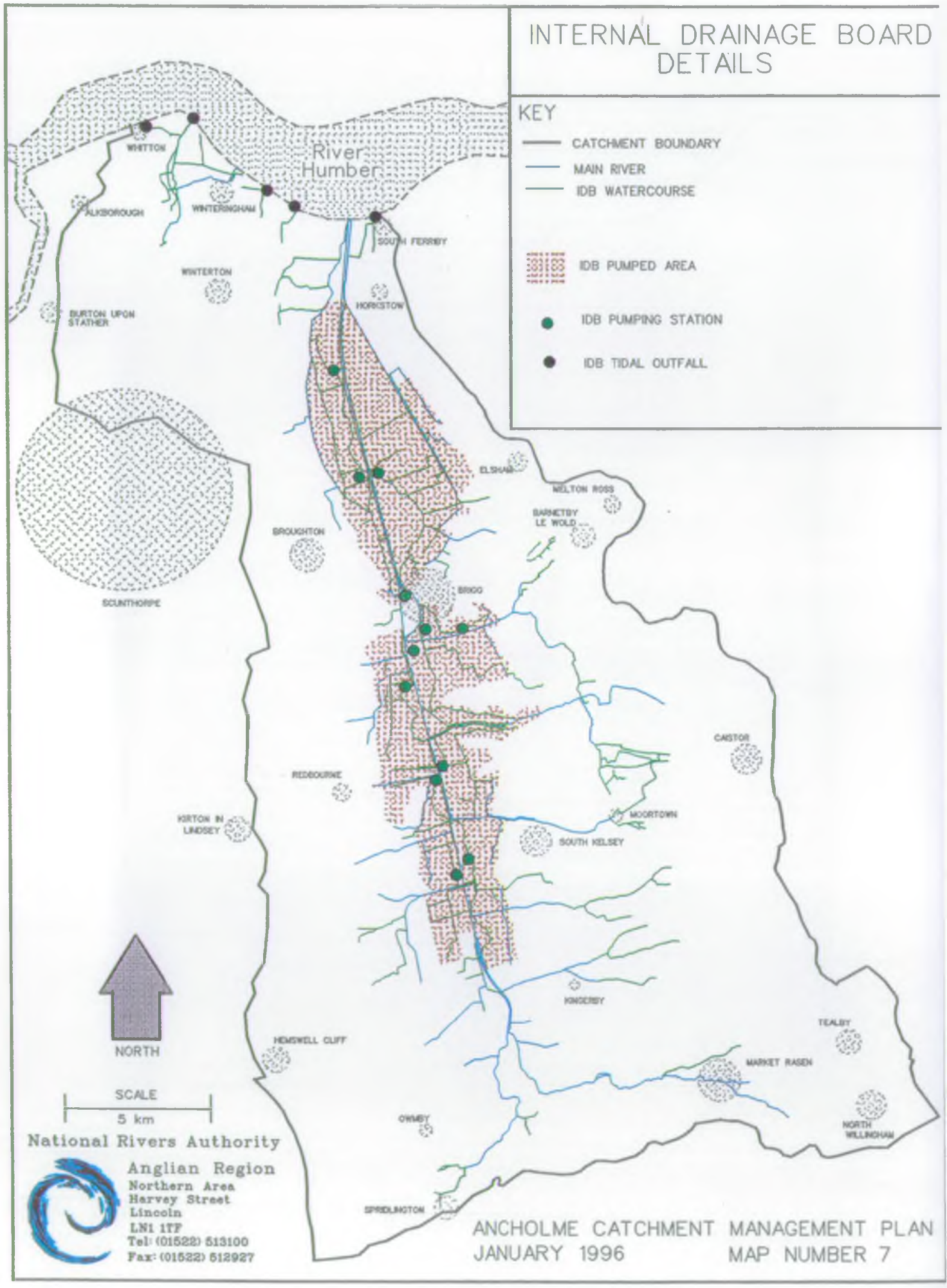
ANCHOLME CATCHMENT MANAGEMENT PLAN
JANUARY 1996
MAP NUMBER 6


INTERNAL DRAINAGE BOARD DETAILS
KEY
CATCHMENT BOUNDARY
MAIN RIVER
IDB WATERCOURSE
IDB PUMPED AREA
IDB PUMPING STATION
IDB TIDAL OUTFALL
River Humber
WHITTON
ALKBOROUGH
WINTERINGHAM
SOUTH FERRIBY
WINTERTON
HORKSTOW
BURTON UPON STATHER
ELSHAM
MELTON ROSS
BARNETBY LE WOLD
BROUGHTON
SCUNTHORPE
BRIGG
CAISTOR
REDBOURNE
KIRTON IN LINDSEY
MOORTOWN
SOUTH KELSEY
KINGERBY
TEALBY
HEMSWELL CLIFF
MARKET RASEN
OWMBY
NORTH WILLINGHAM
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3.6.3 Fluvial Defences

The Catchment area is predominantly agricultural. Drainage within the low lying areas is of vital importance to the productivity of this mainly arable land. The Ancholme IDB provides and maintains a drainage system for the low lying areas. Much of this water is pumped into the River Ancholme before discharge to the Humber.

Waters flowing through the Catchment from the surrounding highland areas are conveyed across the low lying valley floor within raised embankments. South of Brigg, all of the flow is collected into the River Ancholme via it's embanked tributaries and 8 IDB pumping stations which pump water from the adjacent low lying land up into the river. North of Brigg, most of the highland water is collected by watercourses skirting the valley sides which discharge into the Humber through tidal outfalls located at South Ferriby. A further 4 IDB pumping stations contribute flows to the Ancholme north of Brigg.

The Winterton Beck falls within the Catchment Plan area and drains a catchment to the north west of the Ancholme Valley which extends as far south as Scunthorpe. The Winterton Beck discharges into the Humber through Winteringham Haven.

All of the watercourses discharging to the Humber rely on gravity flows and are therefore tide-locked (prevented from discharging due to high tide levels) twice a day. Water storage therefore has to be provided within the watercourse channel area and during high flow periods, rapid flow fluctuations in water level can be expected, particularly in the downstream reaches.

3.6.4 Flood Warning

The NRA provides information and advice to the County Police Forces for the purpose of giving them warnings of areas likely to be affected by flooding for both tidal and fluvial events.

The NRA operate a network of gauging stations on main rivers throughout the Catchment (shown on Map No 2) which continually monitor water flows and levels. These stations are linked to a central computer warning system by way of telemetry. This allows tidal and fluvial conditions to be monitored and advance warnings provided to the police based on a colour phase system which indicates the likelihood and severity of a particular event

3.7 FISHERIES

The National Rivers Authority has a duty to maintain, improve and develop fisheries and to further the conservation of fish species. Fish populations are affected by the quality and quantity of water as well as by the availability of suitable physical habitat features. Fish are therefore important indicators of the overall health of the river.

The NRA aims to undertake fish population surveys on major rivers and drains on a three year rolling programme. Within this catchment, fisheries surveys have been conducted on the Ancholme and it's tributaries during 1979, 1983, 1986, 1989 and 1993.

Traditionally, fisheries classification has been based purely on fish biomass, ie grams per square metre. This scheme has now been extended to include physical river features, namely width and gradient. The rivers are now graded on an A to E scale for both biomass and species richness. Appendix 2 explains these grading methodologies.

Most of the river and drain systems surveyed contain a high biomass of coarse fish. These results reflect the rich lowland nature of the waters contained within this catchment which provide ideal conditions for coarse fish species.

The fish species present in the lowland rivers and drains are indicative of the nature and habitat of such rivers with roach and common bream being the dominant species.

The River Ancholme supports an excellent fish population throughout the main river section. The Upper River Rase, a tributary of the Ancholme, contains a small population of native brown trout - indicative of cool, clear, spring fed headwaters.

Commercial eel fishing occurs in the catchment on the main river Ancholme, some of the major tributaries and on some still waters.

3.8 RECREATION AND AMENITY

3.8.1 General

The NRA has a duty to generally promote the use of inland and coastal waters and land associated with them for the purpose of recreation.

The water environment is extensively used for recreational purposes, including angling, sailing, canoeing and general recreational and amenity access for horse-riding and relaxation. Facilities are located adjacent to many waterways, enabling these recreational activities to function.

The town of Brigg has close connections with the river Ancholme. The Old river channel provides mooring facilities for boats and many footpaths along river bank allow good public access.

As a waterway, recreational boat use is an important feature. Access is provided through the lock at S. Ferriby to the Humber and numerous craft take advantage of the link with Brigg.

Throughout the catchment there are numerous enclosed stillwaters which are used for recreation and leisure, these waters contain both coarse and trout fish.

3.8.2 Public Access

In urban areas many people live adjacent to watercourses, many more visit for general recreational activities. The visual appearance and colour of water is therefore very important to these users.

The River Ancholme is fortunate in having footpath access along much of it's length and numerous bridges allow pedestrian access at many points along the main river length.

3.8.3 Angling

Freshwater fishing is carried out extensively throughout the catchment on both rivers and lakes. The River Ancholme is one of the Area's premier coarse fisheries and it attracts many visiting anglers and has provided excellent angling opportunities historically and to the present day. Access for disabled people is provided at several sites along the main river to allow safe and convenient angling opportunities.

Angling activities are controlled by the Scunthorpe and District Angling Association who lease the Ancholme from the NRA and who organise regular fishing matches. Pleasure angling occurs along the length of river.

Angling activities on stillwaters are popular throughout the catchment and provide an important recreational resource for the area. Toft Newton Reservoir is regularly stocked with trout to support an important "put and take" reservoir fishery. This 40 acre water is the largest salmonoid reservoir fishery in Lincolnshire and consequently represents an important facility for local and visiting people. Disabled angler facilities in the form of a 'wheely boat' are provided at this site which is owned by the National Rivers Authority.

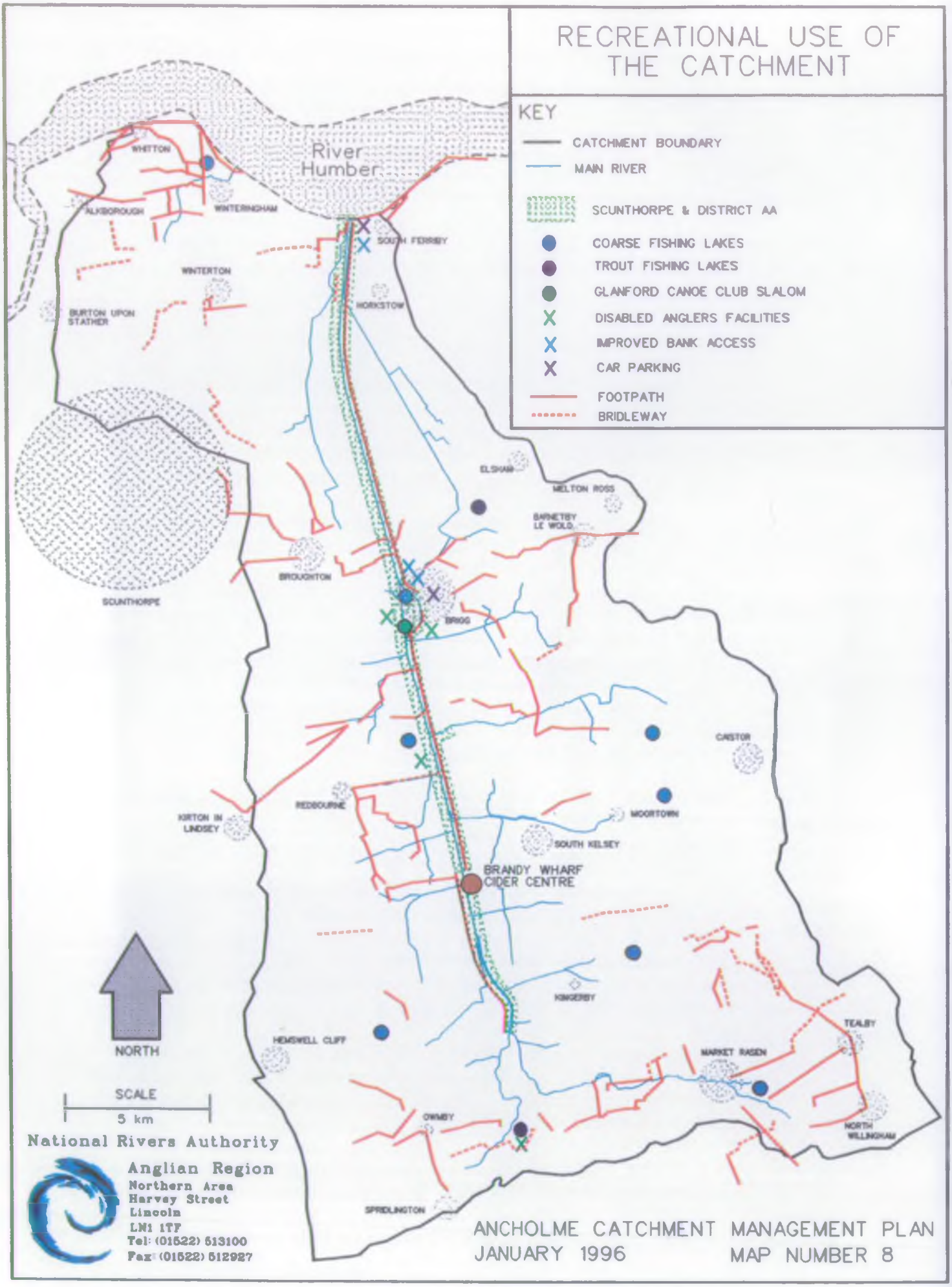
RECREATIONAL USE IN THE CATCHMENT IS SHOWN ON MAP NO. 8

3.9 CONSERVATION

The NRA has a statutory duty when exercising all its functions to further the conservation of flora and fauna. This includes wildlife such as kingfishers, may-flies and water violets, which are truly dependent upon the river for their existence, and those species which simply exploit the river corridor, such as owls. In formulating its own proposals or considering proposals from other parties, the NRA must take into account:-

- The protection of areas formally designated as being of particularly high conservation value e.g. RAMSAR sites, Special Protection Areas (SPA), Environmentally Sensitive Areas (ESA), National Natural Reserves (NNR) and Sites of Special Scientific Interest (SSSI).

- The protection of those sites which, although valuable in ecological terms, are not formally protected e.g. County Trust Nature Reserves and Sites of Nature Conservation Interest (SNCI).


RECREATIONAL USE OF THE CATCHMENT
KEY
CATCHMENT BOUNDARY
MAIN RIVER
SCUNTHORPE & DISTRICT AA
COARSE FISHING LAKES
TROUT FISHING LAKES
GLANFORD CANOE CLUB SLALOM
DISABLED ANGLERS FACILITIES
IMPROVED BANK ACCESS
CAR PARKING
FOOTPATH
BRIDLEWAY
River Humber
WHITTON
ALKBOROUGH
WINTERINGHAM
SOUTH FERRIBY
WINTERTON
BURTON UPON STATHER
HORKSTOW
ELSHAM
MELTON ROSS
BARNETBY LE WOLD
BROUGHTON
SCUNTHORPE
BRIGG
CAISTOR
REDBOURNE
KIRTON IN LINDSEY
MOORTOWN
SOUTH KELSEY
BRANDY WHARF CIDER CENTRE
KIRMINGTON
TEALBY
HEMSWELL CLIFF
MARKET RASEN
OWMBY
NORTH WILLINGHAM
SPRIDLINGTON
NORTH
SCALE
5 km
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MAP NUMBER 8

- Consultations with outside organisations where NRA work or consent is likely to impact on the sites above.

The Government, through the Countryside Commission is now encouraging farmers to combine their commercial farming practices with conservation awareness. The scheme, called Countryside Stewardship (to be adopted by MAFF), allows farmers financial compensation for returning land to a more natural state. This has obvious environmental benefits and in some instances flood defence benefits for the NRA.

The largest proportion of the catchment consists primarily of reclaimed fresh and salt water wetlands. Drainage started as early as 1289 for navigation purposes but as late as 1830, 5000-6000 acres were still flooded each winter. By the turn of the 19th century the present drainage pattern was largely complete. This manmade system has resulted, however, in an impoverished wetland environment. River corridor and "in-channel" habitat and plant diversity are poor, and fenland habitats are only represented by waterside margins and a small number of abandoned brick

pits. The majority of river corridors are under intensive arable farming. In a few places riverside "buffer zones" of trees or grassland do significantly increase conservation value but these are only a small proportion of the catchment.

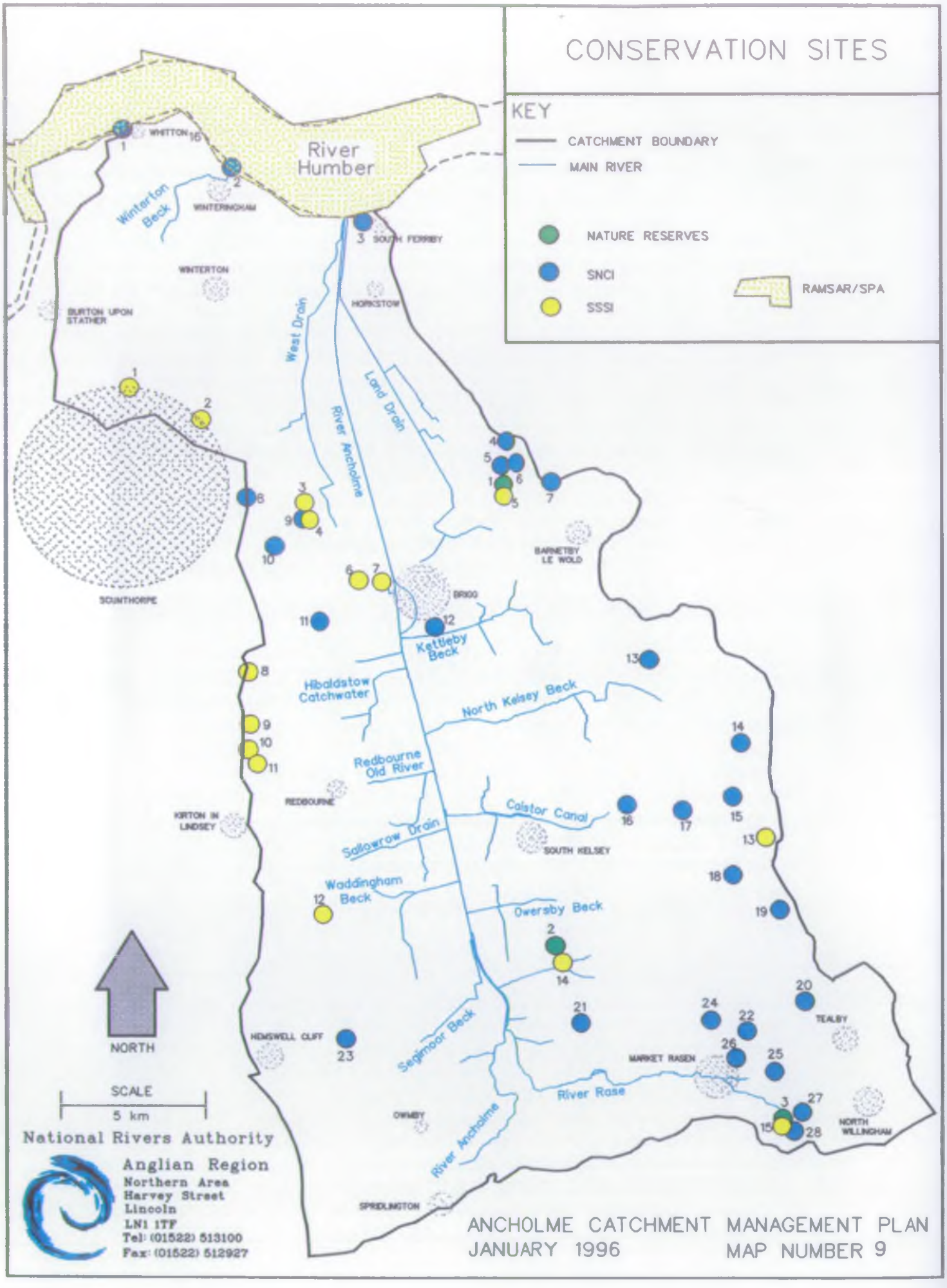
DETAILS OF CONSERVATION SITES ARE SHOWN ON MAP NO. 9

3.10 CONSERVATION-ARCHAEOLOGY

The landscape of Britain contains a rich heritage and archaeological features. These include megalithic monuments, Roman remains, castles, deserted villages, ecclesiastical buildings, great halls and bridges. Some sites protected or managed for their historic interest are also valuable for wildlife, and as a result can form important habitats. Archaeologically, rivers, lakes and alluvium-covered areas are important because of the types of site preserved, and the possibility of anaerobic conditions permitting the preservation of organic materials. Of all landscape environments, rivers, lakes and alluvium spreads are possibly the least well documented archaeologically, probably because, until disturbed, remains preserved in these areas are among the best protected in the country.

The NRA has a duty to have regard to features of archaeological and historic interest during all aspects of NRA work under Section 16(1) of the Water Resources Act 1991. However, the principle legislation affecting monuments in England is contained in the Ancient Monuments and Archaeological Areas Act 1979, which was subsequently amended by the National Heritage Act 1983. The Secretary of State is required to compile and maintain a schedule of monuments to which statutory protection is afforded.

Historic landscapes within the catchment are designated by English Heritage, whilst Scheduled Monuments (SMs) are designated by the Department of National Heritage on advice from English Heritage. Other historical and archaeological sites may fall within areas designated as Environmentally Sensitive Areas by MAFF, or be covered by the Countryside Stewardship agreement with the Countryside Commission.


CONSERVATION SITES
KEY
CATCHMENT BOUNDARY
MAIN RIVER
NATURE RESERVES
SNCI
SSSI
RAMSAR/SPA
River Humber
WHITTON
WINTERTON
WINTERINGHAM
SOUTH FERRIBY
HORKSTOW
BURTON UPON STATHER
SCUNTHORPE
BARNETBY LE WOLD
BRIGG
REDBOURNE
KIRTON IN LINDSEY
SOUTH KELSEY
HEMSWELL CLIFF
OWMBY
MARKET RASEN
TEALBY
NORTH WILLINGHAM
SPRIDLINGTON
Winterton Beck
West Drain
River Ancholme
Land Drain
Kettleby Beck
Hibaldstow Catchwater
North Kelsey Beck
Redbourne Old River
Calstor Canal
Sallowrow Drain
Waddingham Beck
Owersby Beck
Segimoor Beck
River Rase
NORTH
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MAP NUMBER 9

NATURE RESERVES

1 WRAWBY MOOR
2 KINGERBY BECK MEADOWS
3 LINWOOD WARREN

SITES OF NATURE CONSERVATION INTEREST

1 WHITTON BOG
2 WINTERINGHAM HAVEN
3 MANOR HOUSE FARM FIELD
4 ELSHAM MARSH
5 ELSHAM HALL COUNTY PARK
6 ELSHAM SANDSTONE
7 ELSHAM SAND PIT
8 SANTON WOOD
9 FAR WOOD FARM MEADOW
10 BROUGHTON WEST WOOD
11 SCAWBY PARK WEST POND AND EAST POND
12 CANDLEY BECK WESTRUM
13 GRASBY MEADOWS
14 WATER HILLS
15 NETTLETON GRASSLAND
16 RASPBERRY PLANTATION
17 NETTLETON MOOR AND WOOD
18 ACRE HOUSE PASTURE
19 NETTLETON CHALK PIT
20 WALESBY WOOD
21 KINGERBY BELT
22 WILLINGHAM FOREST
23 NORTON PLACE FISH POND
24 MIDDLE RASEN PLANTATION
25 WILLINGHAM FOREST
26 PADLEYS WOOD
27 WILLINGHAM FOREST
28 LITTLE LONDON WOOD

SITES OF SPECIAL SCIENTIFIC INTREST

1 CONESBY QUARRY
2 RISBY WARREN
3 BROUGHTON FAR WOOD
4 BROUGHTON ALDER WOOD
5 WRAWBY MOOR
6 CASTLETHORPE TUFA SITE
7 CASTLETHORPE TUFA SITE
8 MANTON AND TWIGMOOR
9 MANTON STONE QUARRY
10 CLEATHAM QUARRY
11 CLIFF FARM PIT
12 CLIFF HOUSE
13 NETTLETON CHALK PIT
14 KINGERBY BECK MEADOWS

RAMSAR/SPA

16 HUMBER FLATS AND MARSHES

County Archaeologists classify land using four levels of archaeological importance:

- "scheduled monuments" are afforded legal protection;
- "Historic Cores" include those villages whose origins are medieval or earlier;
- "Areas of great archaeological interest", where there are a considerable number of known sites;
- "Areas of lower archaeological interest" where relatively few archaeological sites exist or have been identified.

SCHEDULED MONUMENTS ARE SHOWN ON MAP NO. 10

From an operational perspective, the NRA follow the necessary consultation procedures pertaining to each of these classifications, this includes consulting with the County Archaeologist on any scheme which involves the movement of soil or changes in water levels.

The County Council in the area maintains a detailed list of known archaeological sites on the Sites and Monuments Record (SMR). The SMR is updated as fresh information is made available as a result of new excavation and survey work. The NRA recognises the County SMR as the primary source of archaeological information and advice and will consult them as a matter of course regarding such data.

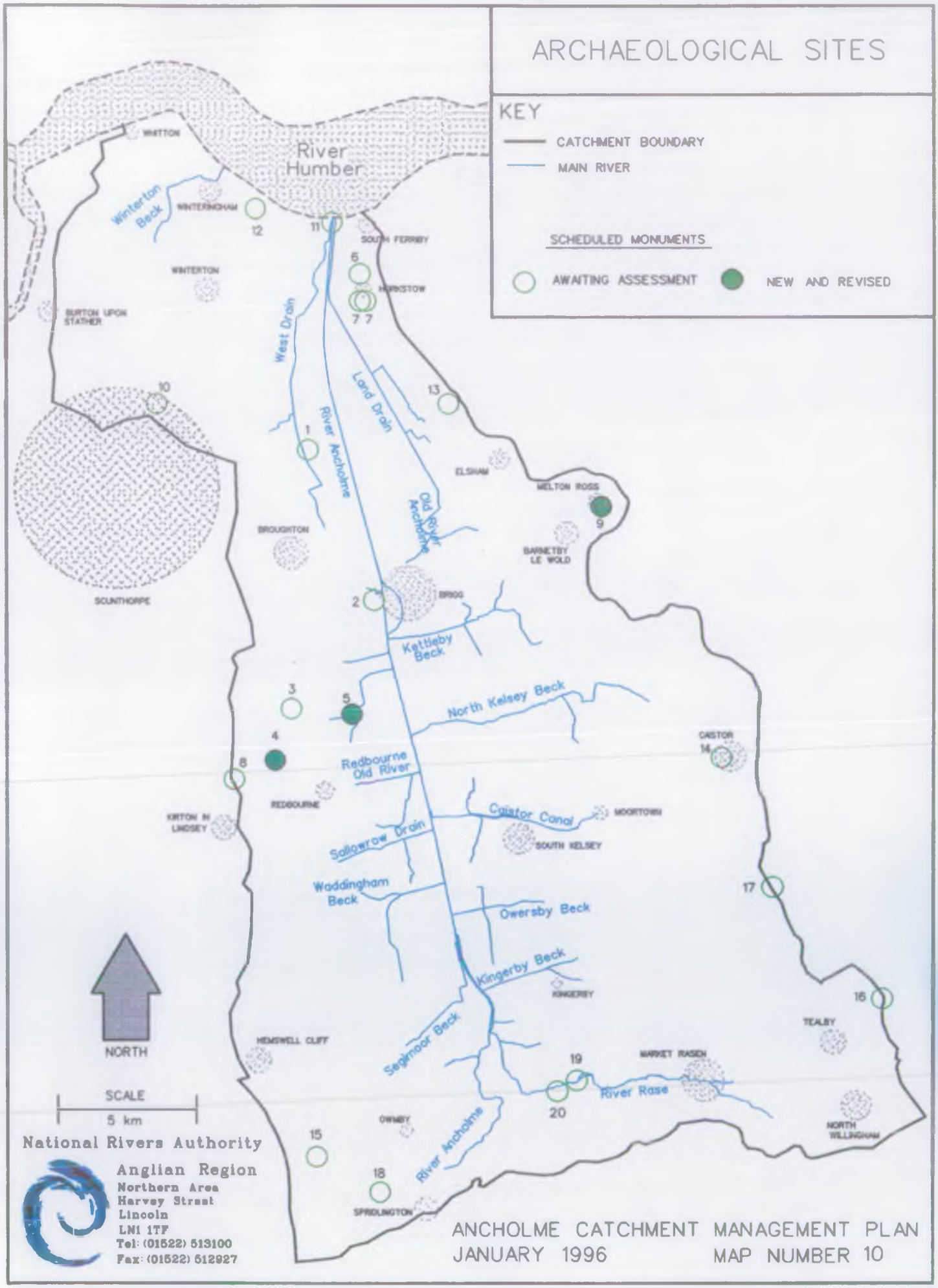
Any new designations will be notified to the NRA who will ensure accurate, up to date listings are maintained.

There are 20 Scheduled Monuments in the catchment which are of national importance. In addition, numerous non-statutory sites also exist (not shown on Map).

The NRA aims to improve links with County Archaeologists and other appropriate organisations. Wherever possible, the NRA will continue to seek to protect sites associated with watercourses from direct damage and from drying out.

3.11 NAVIGATION

The National Rivers Authority is the Navigation Authority for the River Ancholme from South Ferriby to Bishops Bridge (Anglian Water Authority Act 1977). The NRA's principal aim in relation to the Ancholme is to improve and maintain the navigation and its facilities for use by the public.


ARCHAEOLOGICAL SITES
KEY
CATCHMENT BOUNDARY
MAIN RIVER
SCHEDULED MONUMENTS
AWAITING ASSESSMENT
NEW AND REVISED
River Humber
WHITTON
Winterton Beck
WINTERINGHAM
WINTERTON
BURTON UPON STATHER
SOUTH FERRIBY
HORKSTOW
West Drain
Land Drain
River Ancholme
Old River Ancholme
ELSHAM
WELTON ROSS
BARNETBY LE WOLD
BROUGHTON
SCUNTHORPE
BRIGG
Kettleby Beck
North Kelsey Beck
CAISTOR
Redbourne Old River
REDBOURNE
KIRTON IN LINDSEY
Caistor Canal
MOORTOWN
SOUTH KELSEY
Sallowrow Drain
Waddingham Beck
Owersby Beck
Kingerby Beck
KINGERBY
TEALBY
NEWSWELL CLIFF
Segmoor Beck
MARKET RASEN
River Rase
OWMBY
River Ancholme
NORTH WILLINGHAM
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ARCHAEOLOGICAL SITES

1 THORNHOLME PRIORY
2 CASTLETHORPE MEDIEVAL VILLAGE
3 ROMANO-BRITISH SETTLEMENT
4 GAINSTHORPE MEDIEVAL RURAL SETTLEMENT
5 HIBALDSTOW MILL
6 ROMAN VILLAGE
7 SITE OF JACOBEAN MANOR HOUSE AND GARDEN
8 MOUNT PLEASANT ROMAN VILLA
9 MOATED SITE & FISHPOND
10 SAWCLIFFE DESERTED MEDIEAVAL VILLAGE
11 FERRIBY SLUICE
12 OLD WINTERINGHAM ROMAN SETTLEMENT
13 ROMAN SITE
14 CAISTOR ROMAN TOWN
15 OWMBY ROMAN SETTLEMENT
16 BULLY HILL ROUND BARROW
17 TOP BUILDINGS LONG BARROW
18 DESERTED MEDIEVAL VILLAGE
19 PACKHORSE BRIDGE
20 MOUND KNOWN AS BROKENBACK

3.11.1 Historic Perspective

The River Ancholme was in use as a navigation before the 13th century but it was in 1294 that works were undertaken to facilitate the passage of cargo craft. South Ferriby Sluice was constructed in 1635, but around 1767 the sluice was re-built with the navigation separate from the Ancholme from Horkstow to South Ferriby.
The Ancholme Navigation was extended in 1793 by the construction of the Caistor Canal which joined the Ancholme in the vicinity of South Kelsey and was navigable up to Moortown. The canal was used to convey coals, wood and other goods.

In 1802 an Act (plus Amendment) was passed to make the River Ancholme navigable from Ferriby Sluice to Bishops Bridge, with two new locks to be constructed at Harlam Hill and Kingerby. It is suspected that the proposal for a lock at Kingerby did not proceed due to lack of funds. By 1827 the lock at Harlem Hill was complete, but 1844 land drainage improvements and a new sluice and lock at South Ferriby were complete.

The old terminus of the Navigation was, and still is, Bishops Bridge, so named because of the bridge (consisting of 2 gothic arches) built by one of the Bishops of Lincoln. In terms of the navigation it used to be a busy place and in the late 1800's barges carrying farming equipment, coal, oil, corn, wood and livestock landed and left from the wharf. The Navigation was busy in this period as it provided a link to the major industrial towns of Yorkshire and the rest of the country. In 1828 a passenger boat provided weekly a service from Brigg to Hull. Boats also left from Brigg to Leeds and Wakefield once a week. More regular travel was provided by 'Fly Boat'. One left Brigg daily (except Sundays) and connected at South Ferriby with the Steam Packet 'Elizabeth' from Hull. In 1891 the Goole and Hull Steam Packet Company Ltd were given a licence to operate a steam driven craft on the river.

By the 1930's boat traffic on the river had declined, although cargo craft over 90 tonnes still operated carrying fuel, spirit, maize, barley, linseed, fish meal etc. In 1962 55 such craft used the Ancholme. However, during and after the 60's there was a steady decrease in the numbers of commercial craft on the river and an increasing use of pleasure craft.

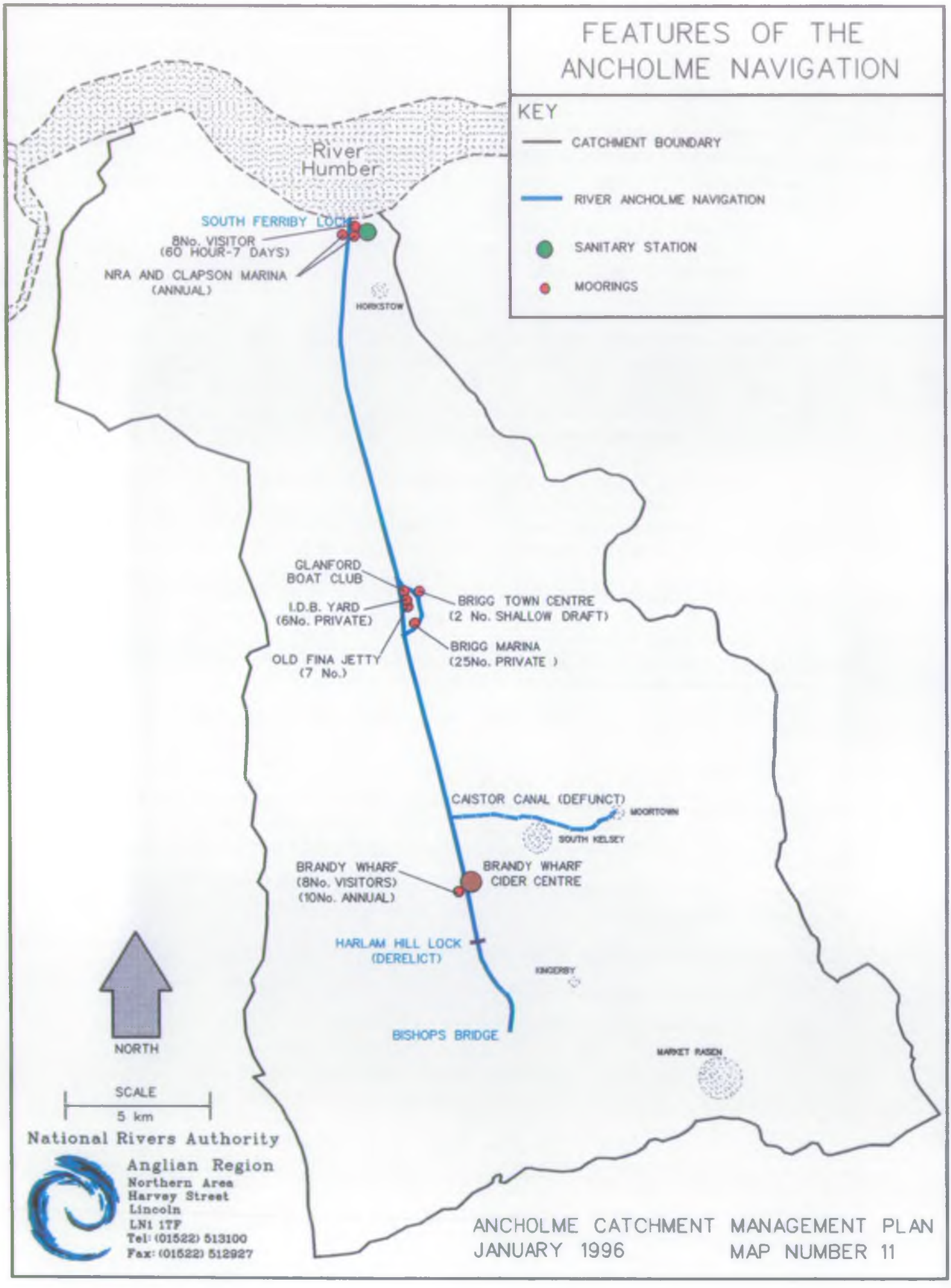
3.11.2 Current Perspective

FEATURES OF THE ANCHOLME NAVIGATION ARE SHOWN ON MAP NO.11

The Ancholme Navigation is 31 km from Bishops Bridge to South Ferriby it has 2 lock structures on the Navigation at South Ferriby and Harlam Hill. South Ferriby Lock links the Ancholme Navigation with the Humber estuary. Harlam Hill lock is currently derelict.

The Ancholme is an important 'safe haven' for the Humber, allowing craft to shelter in times of bad weather or difficulty.

There are currently around 200 boats registered on the Ancholme Navigation.


FEATURES OF THE ANCHOLME NAVIGATION
KEY
CATCHMENT BOUNDARY
RIVER ANCHOLME NAVIGATION
SANITARY STATION
MOORINGS
River Humber
SOUTH FERRIBY LOCK
8No. VISITOR (60 HOUR-7 DAYS)
NRA AND CLAPSON MARINA (ANNUAL)
HORKSTOW
GLANFORD BOAT CLUB
I.D.B. YARD (6No. PRIVATE)
OLD FINA JETTY (7 No.)
BRIGG TOWN CENTRE (2 No. SHALLOW DRAFT)
BRIGG MARINA (25No. PRIVATE)
CAISTOR CANAL (DEFUNCT)
MOORTOWN
SOUTH KELSEY
BRANDY WHARF (8No. VISITORS) (10No. ANNUAL)
BRANDY WHARF CIDER CENTRE
HARLAM HILL LOCK (DERELICT)
KINGERBY
BISHOPS BRIDGE
MARKET RASEN
NORTH
SCALE
5 km
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3.11.3 South Ferriby Lock

South Ferriby Lock is situated at the confluence of the River Ancholme and the River Humber and forms part of the South Ferriby Lock and Sluice complex. The lock is owned, maintained and operated by the NRA.

The lock will accept craft of:

Length	:	19.99 metres (68 feet)
Draught	:	2.94 metres (10 feet)
Beam	:	5.58 metres (19 feet)
Headroom	:	unlimited

The A1077 Scunthorpe to Barton on Humber road crosses the lock pit on a hydraulically operated steel lift bridge. The lock and sluice structure is a Scheduled Monument.

The lock was designed by Sir John Rennie and was constructed between 1842 and 1844 it has four pairs of timber mitre gates. The lock is filled and emptied by means of side culverts with cast iron paddles which are raised by means of hand operated pinions and screws. The lock gates are opened and closed by hand operated winches and chains or by means of manually operated counter balance beams. The hydraulic lift road bridge is electrically operated and is part of the locking operation controlled by the lock keepers.

3.12 LAND USE/DEVELOPMENT

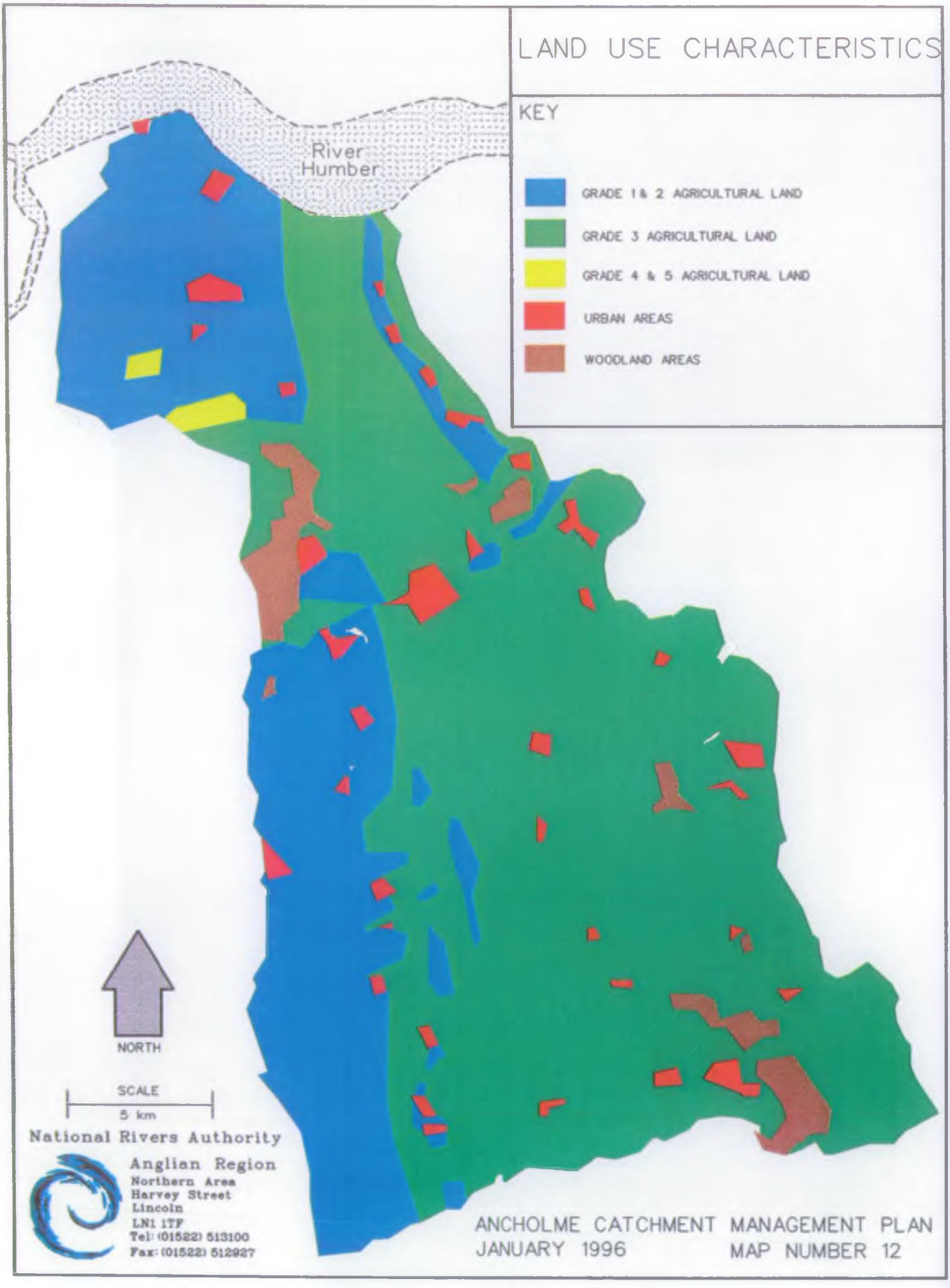
DETAILS OF LAND USE ARE SHOWN ON MAP NO. 12

3.12.1 Agriculture

The Ministry of Agriculture, Fisheries and Food's, Agricultural Land Classification (ALC) System classifies land by grade according to the extent to which its physical or chemical characteristics impose long term limitations on agricultural use. These limitations may affect flexibility of cropping, level of yield, the consistency of yield or the cost of obtaining it. Under the MAFF ALC System, land is classified into one of five grades; Grade 1 being of excellent quality, Grade 5 being of very poor quality. Grade 3 comprises good to moderate quality land, being sub divide into grades 3A and 3B.

Grades 1, 2 and 3A agricultural land is recognised in land use planning terms as a national resource for the future, having a special importance.

Approximately 33% of land in the Ancholme Catchment Area is classified as Grade 1 and 2 with a further 58% as Grade 3. Only 2.4% is classified as Grade 4 and with the remainder 6.6% in non-agricultural or urban use. This compares with the national figures for England of 16% (Grades 1 &2) and 44% (Grade 3).


LAND USE CHARACTERISTICS
KEY
GRADE 1 & 2 AGRICULTURAL LAND
GRADE 3 AGRICULTURAL LAND
GRADE 4 & 5 AGRICULTURAL LAND
URBAN AREAS
WOODLAND AREAS
River Humber
NORTH
SCALE
5 km
National Rivers Authority
Anglian Region
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Agriculture is the predominant economic activity and land use within the Catchment Area, with a total of 61,415 hectares in agricultural use, distributed among 565 agricultural holdings, of which 310 are full time and 255 are part time. The recent trend indicates a decrease in full-time holdings, and significant increase in part-time holdings compared with ten years ago, reflecting the national picture.

Holding size by area in the Catchment is somewhat "polarised", with 225 holdings less than 20 hectares in size and 175 holdings greater than 100 hectares. By far the predominant holding type of those classified as "full time" is that given over to cropping. There is also a significant number of pig and poultry holdings, with relatively few dairy, cattle and sheep, horticulture and mixed types.

Over much of the area, the highly productive potential of the land is in part realised as a result of the installation of a comprehensive network of pumped and gravity fed land drainage and field under drainage systems.

Cropping

Of the total agricultural area of some 61,415 hectares in the Catchment Area, arable crops and fallow account for over 45,500 hectares, (75%).

Crops grown include cereals, predominantly wheat and barley, and other combinable break crops, consisting of oilseed rape, field beans and dry peas, as well as root crops (potatoes and sugar beet) and horticultural crops. Wheat accounts for nearly 48% of all crops grown. Over the last ten years, with the exception of field beans and dried peas, there has been a decline in the area of all crops grown, most notably barley and potatoes and to a lesser extent wheat.This is largely attributable to Common Agricultural Policy. In 1994, set-aside land in the Catchment amounted to 6,981 hectares.

Livestock

Grassland, including rough grazing, accounts for just over 6,500 hectares of the Area, a decline of 18% from ten years ago. Grazing livestock numbers of all types are relatively low and all sectors, with the exception of beef breeding herd, have shown a recent decline. Fattening pig numbers have increased by nearly 50% since 1984, and in the poultry sector, while the laying flock has decreased significantly, breeding flock numbers have expanded dramatically. Pig and poultry enterprises in the area generally tend to be concentrated in a number of relatively large units.

The agricultural industry obviously plays a significant role, both in terms of this catchment's economical welfare and in terms of its impact upon the physical environment.

Agricultural land use can raise conflicts within the water environment:

- the maintenance practices undertaken on watercourses and water levels maintained to ensure effective land drainage have a marked effect upon flora and fauna;

- the use of fertilisers and herbicides influences surface water quality, enriching it with nutrients encouraging its eutrophic state. It also impacts on land drainage by increasing weed growth and on groundwater quality by increasing nitrate levels;

- The abstraction of water for irrigation affects water levels.

MAFF are promoting several policies towards improving the water environment, such as Countryside Stewardship, the Code of Good Agricultural Practice for the Protection of Water, and defining Nitrate Sensitive Areas (to help protect groundwater sources used to supply drinking water). There are also other EU initiatives relating to Nitrate Vulnerable Zones.

3.12.2 Forestry

Forestry and woodland cover a land area of 4% within this catchment, the woods at South Willingham and at Broughton constituting most of that area.

Until recently the creation of forests has been primarily in the uplands, in future more are likely to be established in lowland areas. Most forestry operations have an impact upon the quantity and quality of water flowing through forest stands.Potential problems include a reduction in water yield for aquifers, changes in surface water run-off patterns and contamination of water from chemicals/pesticides.

There are no known forestry related issues in this catchment.

3.12.3 Development

Changes in land use and development have a potentially adverse impact upon the water environment.

They can result in:

i) An increased risk/occurrence of flooding as a consequence of changes to surface water drainage;

ii) An increased risk to water quality, eg:

   a) from effluent discharges to surface water and groundwaters;

   b) from agriculture;

   c) from increased pressure upon the sewerage infrastructure;

iii) An increased demand for water for industrial/agricultural use, and for public water supply;

iv) A risk to flora and habitats, as a consequence, directly or indirectly, of remedial flood defence works and/or water quality problems.

Through its involvements in the Town and Country Planning process, the NRA seeks to influence the development and land use change process in order to protect the water environment from these possible impacts. The final decision on planning matters rest with the Local Planning Authorities (LPAs).

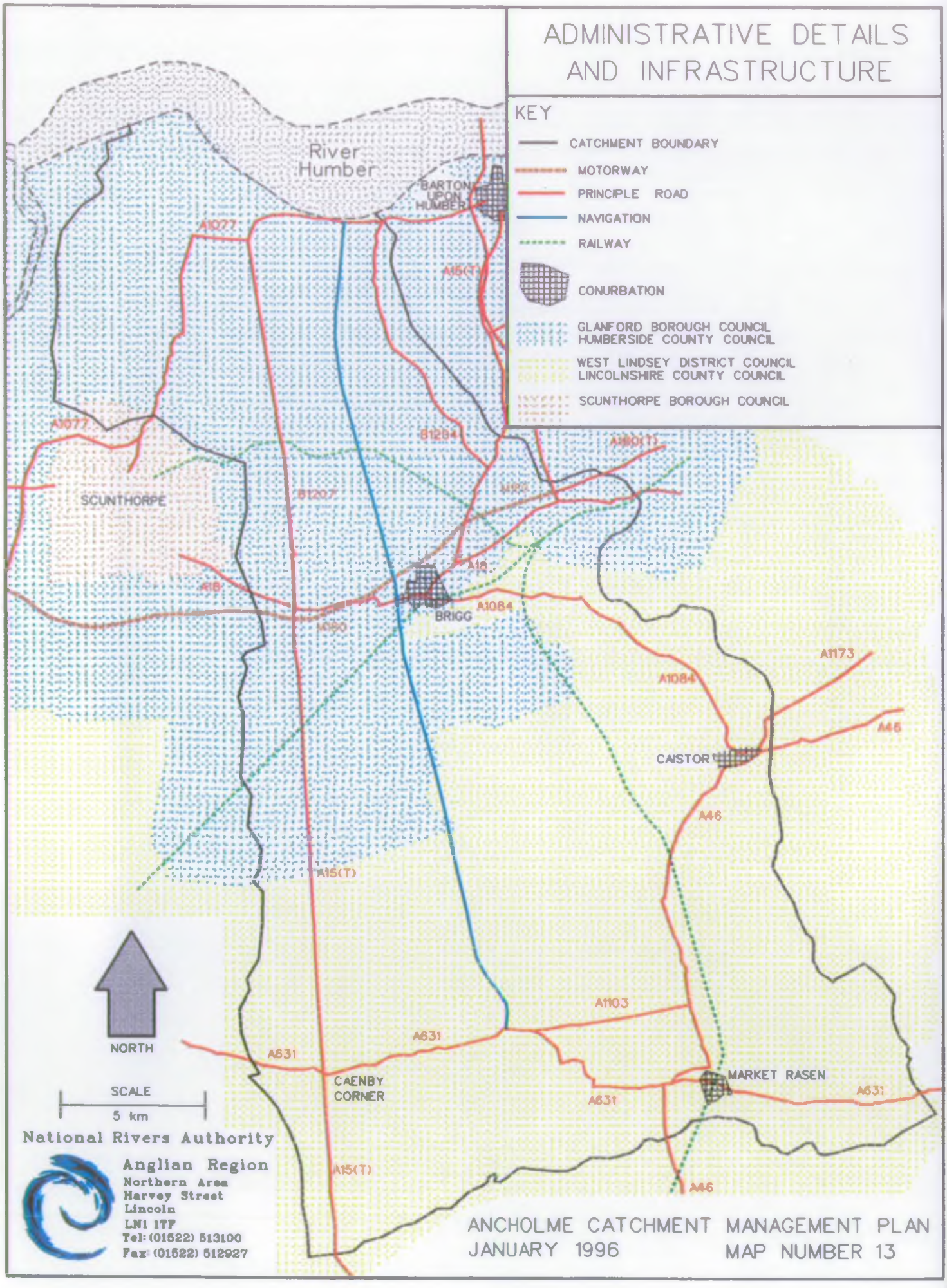
The NRA's participation in this process is essentially at two levels:

i) In the short term, the NRA acts as a Consultee in certain types of application under the Town and Country Planning General Development Order. It liaises and advises on proposals which may impact on matters relevant to the NRA.

ii) In the long term, policy and strategy for change in land use is contained in the Development Plans prepared by LPAs.

Any development upon which the NRA is consulted, whether through the formal planning process, or otherwise, provides an opportunity for the NRA to enhance the interests of the water environment.

ADMINISTRATIVE BOUNDARIES AND INFRASTRUCTURE ARE SHOWN ON MAP NO. 13


ADMINISTRATIVE DETAILS AND INFRASTRUCTURE
KEY
CATCHMENT BOUNDARY
MOTORWAY
PRINCIPLE ROAD
NAVIGATION
RAILWAY
CONURBATION
GLANFORD BOROUGH COUNCIL
HUMBERSIDE COUNTY COUNCIL
WEST LINDSEY DISTRICT COUNCIL
LINCOLNSHIRE COUNTY COUNCIL
SCUNTHORPE BOROUGH COUNCIL
River Humber
BARTON UPON HUMBER
A1077
A15(T)
A1077
B1284
A180(T)
SCUNTHORPE
B1207
A18
A18
A1084
BRIGG
A1084
A1173
A46
CAISTOR
A46
A15(T)
A1103
A631
A631
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National Rivers Authority
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MAP NUMBER 13

4.0 CURRENT STATUS

4.1 WATER RESOURCES

This section summarises the total and actual demands for water within the catchment compared with the available resource. Future demands for water are also considered.

The principal water resources in this catchment are the River Ancholme which is augmented by transfers of river water from the Rivers Witham and Trent, and the Lincolnshire Limestone aquifer.

The Lincolnshire Limestone aquifer is important for local supplies of water. The water resources of the Lincolnshire Limestone are fully committed to existing licences. Although some chalk and sandstone outcrops in the east of the catchment this is of less importance to water resources in the catchment.

Water resources are made available, via the NRA's Trent Witham Ancholme river transfer scheme (TWA), to meet existing surface water commitments from the River Ancholme and there is some scope for further development. Winter water abstraction and storage for summer use from minor water courses and becks is encouraged in the catchment.

4.1.1 Surface Water

The Lincolnshire Limestone and Chalk and Sandstone provide some baseflows to rivers leading to the Ancholme. No further summer water can be licensed from these sources. Winter Storage is normally considered available subject to there being no local problems. IDB drains are largely fed via land drainage and can only be considered as a potential winter source for abstraction. The natural summer resources of the River Ancholme would be small, based on limited baseflow from the Limestone and Chalk aquifers.

Flows in the Winterton Beck have been influenced by the ironstone workings in the sub-catchment. Winter water is available for abstraction but no further summer water could be considered for that purpose.

The TWA scheme which is owned and operated by the NRA, is of strategic importance to the surface water resources and abstractions within the Ancholme, Upper Witham and Humberside catchments. The scheme was commissioned in 1974 largely to provide water to meet rapidly rising water demands within the South Humber bank Industrial area which could not be met by increased abstraction from the over committed chalk aquifer of the Lincolnshire Wolds.

The River Ancholme, which is an embanked channel from Bishopbridge to South Ferriby with large storage capacity, is regulated by transfers of water to ensure a continuous and adequate level and flow in the river during dry weather and summer periods.

Figure 3 shows the general layout and principle features of the TWA scheme.

Water is transferred from the River Witham system via a pumping station at Short Ferry which pumps water through 17 km of pipeline to the upper Ancholme at Toft Newton. The outfall works at Toft Newton include a 16.5 hectare embanked reservoir with a maximum depth of 6 metres giving 761 tcm storage of river water, or up to 7 days reserve for emergency release to the Ancholme in the event of failure of plant and equipment at Short Ferry. During low flow periods the River Witham system itself is also augmented by transfer of water from the River Trent at Torksey. The water is pumped via a short pipeline to the Fossdyke Canal which carries it to the River Witham system.

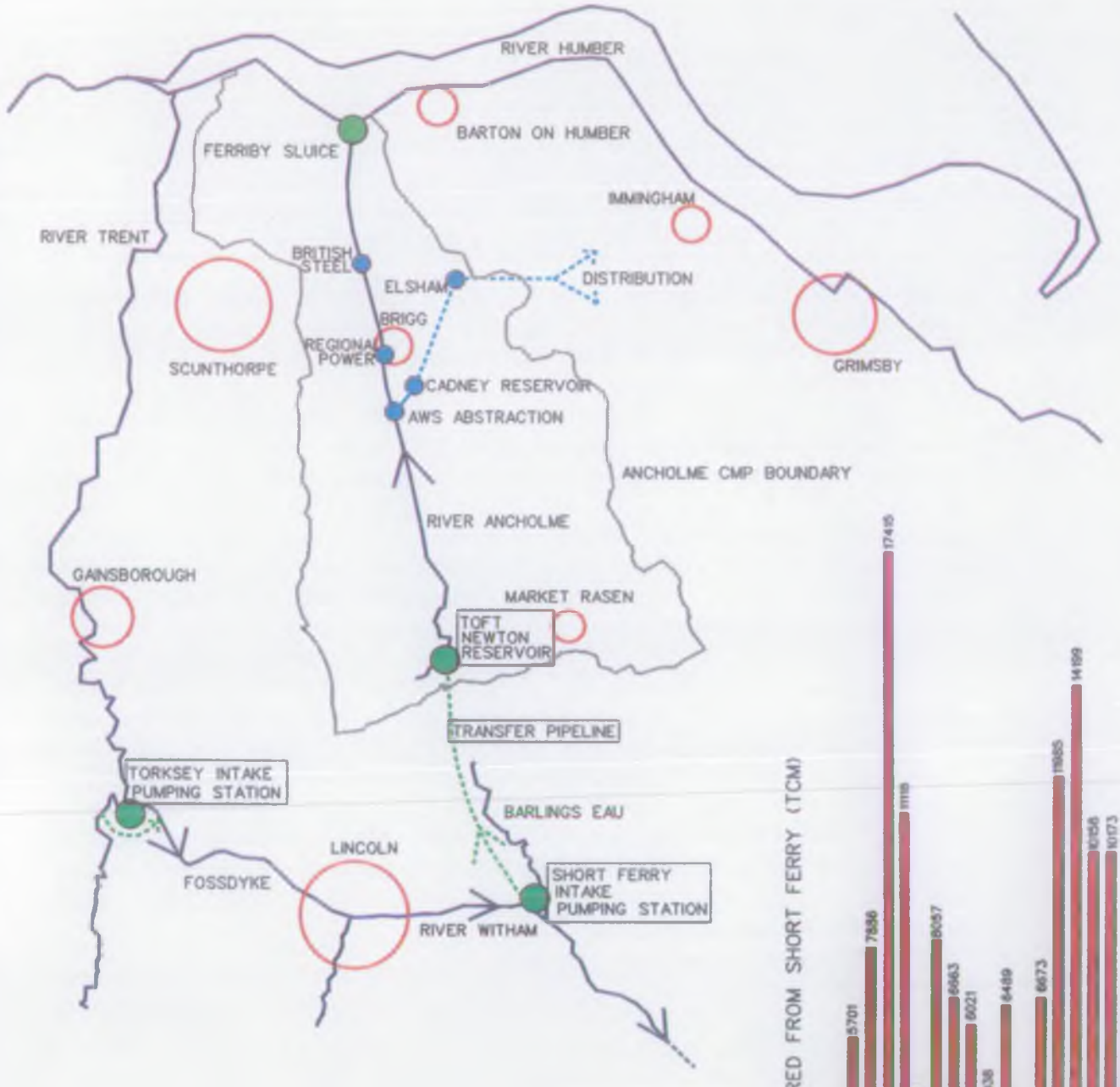
These transfers of water from the River Witham to the Ancholme and from the Trent to the Witham meet a number of needs:

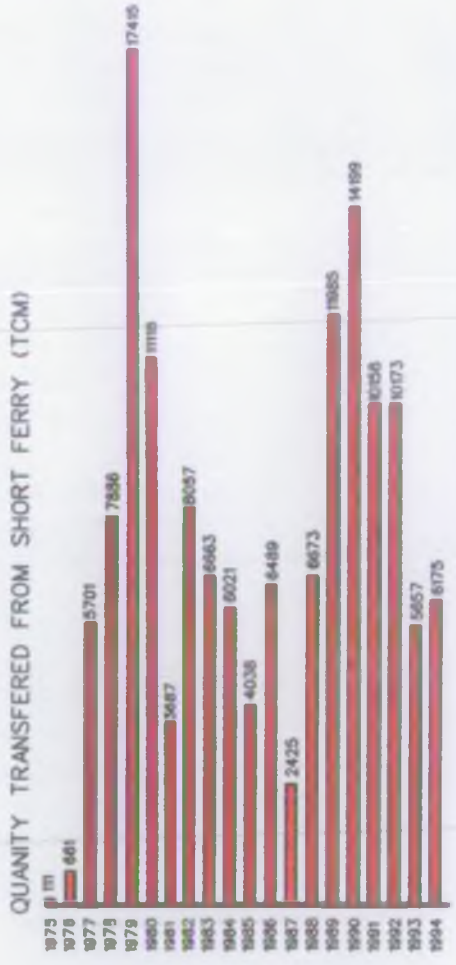
- Abstraction of water by Anglian Water Services at Cadney for public water supply and industrial supply purposes on the South Humber bank.
- Abstraction of water from the Ancholme for industrial use principally Regional Power Generators at Brigg, British Steel at Worlaby and Rugby Cement.
- Abstraction of water to meet spray irrigation from both the River Ancholme and the River Witham.
- Dilution and flushing of saline water in the lower reaches of both the Ancholme and Witham by maintaining a residual flow to tide.
- Maintaining Navigation levels and supporting fishing, recreational and environmental uses on the Rivers Ancholme and Lower Witham.

Currently there are a total of 97 abstraction licences which are supported by the TWA scheme, 18 of which are abstraction licences from the River Ancholme and 79 abstraction licences from the River Witham (60 licences in the East and West Fen system rely on 1 licensed transfer from the River Witham). The Trent Witham Ancholme total supported licensed quantity is 41,059 tcm of which 37,698 tcm is from the Ancholme and 3,361 tcm from the River Witham.

The principal licences listed below account for 93% of total supported licensed quantities with Anglian Water Services, British Steel and Brigg Power Station accounting for 98% of supported licensed quantities from the River Ancholme.

TRENT WITHAM ANCHOLME RIVER TRANSFER SCHEME (TWA)





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JANUARY 1996 FIG NUMBER 3

TABLE 3 - MAJOR ABSTRACTION LICENCE DETAILS

ABSTRACTION SITE		Licensed tcma.	% of Total	% of Ancholme
AWS - Cadney	(Ancholme)	31,000	75.5	82
Brigg Power Station	(Ancholme)	3,740	9.1	10
British Steel	(Ancholme)	2,273	5.5	6
Water Transfer	(Witham)	1,371	3.3	

Under average conditions the River Ancholme only needs to be augmented by transfers in the summer period. The Industrial abstractions and public water supply abstraction at Cadney take place throughout the year.

The needs and quantities of water required to be transferred are currently assessed on a weekly basis during the summer period. These are based on flows and level information provided by our telemetry system together with forecasts of abstraction provided by the principle abstractors on a weekly basis. Close liaison is required between abstractors and the NRA during periods of transfer. Effective and efficient management of river transfers and the management of saline ingress, is made difficult by the lack of flow monitoring in the lower reaches of the River Ancholme and by the lack of day to day information on abstractions, by the major users.

The river transfer scheme is currently fully committed to existing licences, but only under extreme weather conditions and abstraction. ie: If all the licensed abstractors were abstracting at their licensed quantity (their limit) and this coincided with the severest dry year (eg 1976), then the transfer scheme would be operating at its limit.

However, there is scope to license more water from the River Ancholme (and River Witham) that can be supported by river transfers, although any new commitments would be subject to time limits or a "hands off" condition to ensure that existing licensed abstractions are protected.

4.1.2 Groundwater

The principal aquifer in the catchment is the northern Lincolnshire Limestone stretching from Lincoln northwards to the Humber. The Northern Limestone is presently considered fully committed to meet existing licensed abstractions and local spring/river flows; details were published in the Anglian Regions Water Resources strategy "Water Resources in Anglia" in September 1994.

A number of aquifers in the region have been mathematically modelled to improve our understanding of the interaction of abstraction, river flows and groundwater levels. The Northern Limestone aquifer has not yet been represented in this way. The need to define Source Protection Zones for the major groundwater abstraction sources is the major consideration behind development of a resource model to cover the Northern Limestone. Some initial work has been carried out on model development covering the limestone aquifer extending from the Welton area

southwards beyond Lincoln. Further work is planned with a time variant model being available in 1998.

In the sub-catchment of the Winterton Beck, which is to the west of the Lincolnshire Limestone outcrop, the area includes extensive areas of Frodingham ironstone which is an important local aquifer. British Steel pump water from their ironstone workings and there are groundwater abstractors in this area. Limited resources may still be considered available for abstraction subject to local derogation considerations, but water quality may be a further constraint.

Anglian Water Services abstract water from three sources in the Waddingham/Redbourne area, which were the subject of applications for licence variations in 1993/94. As a consequence of NRA concern for the impact of these abstraction changes upon the local water environment, NRA granted licence variations in 1994 for 3 years conditional upon Anglian Water Services carrying out environmental surveys. This approach is in line with our precautionary principle.

4.1.3 Water Demands

Public Water Supplies

Public Water Supplies for use within the Ancholme catchment are largely met from abstraction of groundwater from the Lincolnshire Limestone.

Public Water Supply abstraction in the catchment is dominated by river abstraction at Cadney. This is however exported for use outside the catchment. (Grimsby catchment and to Scunthorpe Industrial area).

The most recent forecasts for growth in demand for public water supplies are very low. The NRA's low growth forecast is for the increase to be less than 1% per annum to 2015. With the introduction of demand management initiatives (eg leakage reductions, metering) the latest water company forecasts are for little or no growth overall. It is likely that growth in demand will be offset by water savings made through leakage reduction. Current licensed entitlements are sufficient to meet forecast demands.

Industrial Demands

Industrial demands for water within the catchment are met largely from the River Ancholme. Increases in licensed abstraction by the present users are not anticipated in the near future. New demands for water will be considered as they arise.

Agricultural Demands (Spray Irrigation)

Recent research for the region indicates that demand for agricultural irrigation will increase by 1.7% per annum to 2001 and thereafter at a rate of 1% per annum. Within the Ancholme catchment there is a very limited area of land which could still be irrigated directly from the River Ancholme or from rivers which can draw upon resources of the Ancholme.

Future demands for water for irrigation across the catchment (remote from the Ancholme) will have to be met through development of winter storage reservoirs.

Recent dry summers and in particular the dry summer of 1995 may lead to an increased interest in further demands by both existing and new abstractors.

4.2 WATER QUALITY

This section considers the status of the catchment with respect to the quality of surface and ground waters. Water quality protection is maintained and improved using a number of methods:

(i) Through the issue of Discharge Consents - Consents are issued to those persons and organisations who discharge effluents. Consents specify the quality and quantity of effluent and conditions under which they are permitted to be discharged.

(ii) By the regular biological and chemical monitoring of surface water and groundwater quality.

(iii) By the regular chemical monitoring of discharges.

(iv) By influencing development proposals through the planning process.

(v) By liaison with Her Majesty's Inspectorate of Pollution (HMIP) in respect of authorisation of prescribed processes under the Environmental Protection Act and the Waste Regulatory Authority regarding Waste Management Licences.

(vi) Setting water quality targets for local Water Quality Management needs.

The main influences upon water quality in this Catchment are: (in no priority)

- the use of the river system for effluent disposal from sewage treatment works;
- intensive land use by the agricultural industry which (a) enrich surface water with nutrients and contribute to their eutrophic conditions, and (b) have led to the contamination of groundwater with nitrates;
- low summer flows;
- saline intrusion - the ingress of salt water into freshwater systems during periods of low flow.

4.2.1 Groundwater

The quality of groundwater is generally good; however, high nitrate levels are found in some groundwaters within the catchment. Groundwater quality is monitored by taking samples from boreholes drilled into the Lincolnshire Limestone and also from springs.

The principal aquifer in the Catchment is the Lincolnshire Limestone. This aquifer, which outcrops in the western part of the Catchment, is used to support a number of major abstractions for Public Water Supply (PWS). In the central part of the Catchment, the aquifer is well protected by overlaying clay deposits (see fig 1, geological cross-section). To the east of the Catchment there is the outcrop of the chalk aquifer. Rain incident on the western edge of the chalk outcrop emerges as springs along its escarpment. These springs ultimately flow into the River Ancholme.

Groundwater is most vulnerable in the outcrop areas little protection is given by overlying shallow, highly permeable soils. Pollution of the aquifer may be by point sources, such as landfill sites or from a diffuse sources, such as fertilisers used in agriculture.

4.2.2 Surface Water

4.2.2.1 General Quality Assessment (GQA)

As well as taking decisions on measures to maintain or improve river quality, the NRA publishes the results from regular surveys of water quality in the Ancholme Catchment. Criteria for deciding which watercourses to include for chemical monitoring include river flow, position of tributaries and the presence of major discharges. The NRA are not aware of any water quality problems in those watercourses not monitored chemically or biologically.

In order to provide a comprehensive picture of the quality of our rivers, different aspects of the water environment will be looked at. We refer to these different aspects as 'windows' because each offers a different perspective on the overall health of the river. A GQA Scheme, comprising four windows, is being developed: a Chemistry Window; a Biology Window; a Nutrient Window; and an Aesthetics Window.

The GQA System is used to make periodic assessments of the quality of water in the Catchment and enables us to report changes over time. The Chemistry Window has already been produced and comprises six water quality grades:

A)	-	Good
B)		
C)	-	Fair
D)		
E)	-	Poor
F)	-	Bad

Appendix 3 shows the chemical standards used to define these grades.

MAP 14 SHOWS THE CHEMICAL GQA FOR THE ANCHOLME CATCHMENT using the results of routine samples taken between 1992 and 1994 inclusive. The catchment is largely of Good/Fair quality (Grades B/C/D), with the exception of a small section of the North Kelsey Beck, the Old River Ancholme and the Land Drain which are classified as Grade E (poor quality).

A combination of slow-moving flows and potentially eutrophic conditions contribute to reduced levels of water quality in these watercourses. These conditions will be accentuated during periods of low flow. At times there is little positive flow in the North Kelsey Beck at the confluence with the River Ancholme, water quality is likely to be affected as a result.

4.2.2.2 Biological Assessment

In addition to chemical monitoring, Biological Assessment is also carried out. This is principally based on the monitoring of aquatic invertebrates. These animals live in river water and so provide information on the quality of water which passes over them. If the water is polluted, then some or all may die, depending on their tolerance to pollution, recovery of the community may take several months. This means that Biological Assessment provides evidence of pollution which may have been missed by the routine spot checks which form the basis for most chemical monitoring.

As some macroinvertebrates respond differently to different chemicals, the data can also give an indication of the type of pollution that may have occurred. Appendix 4 explains the biological classification of watercourses.

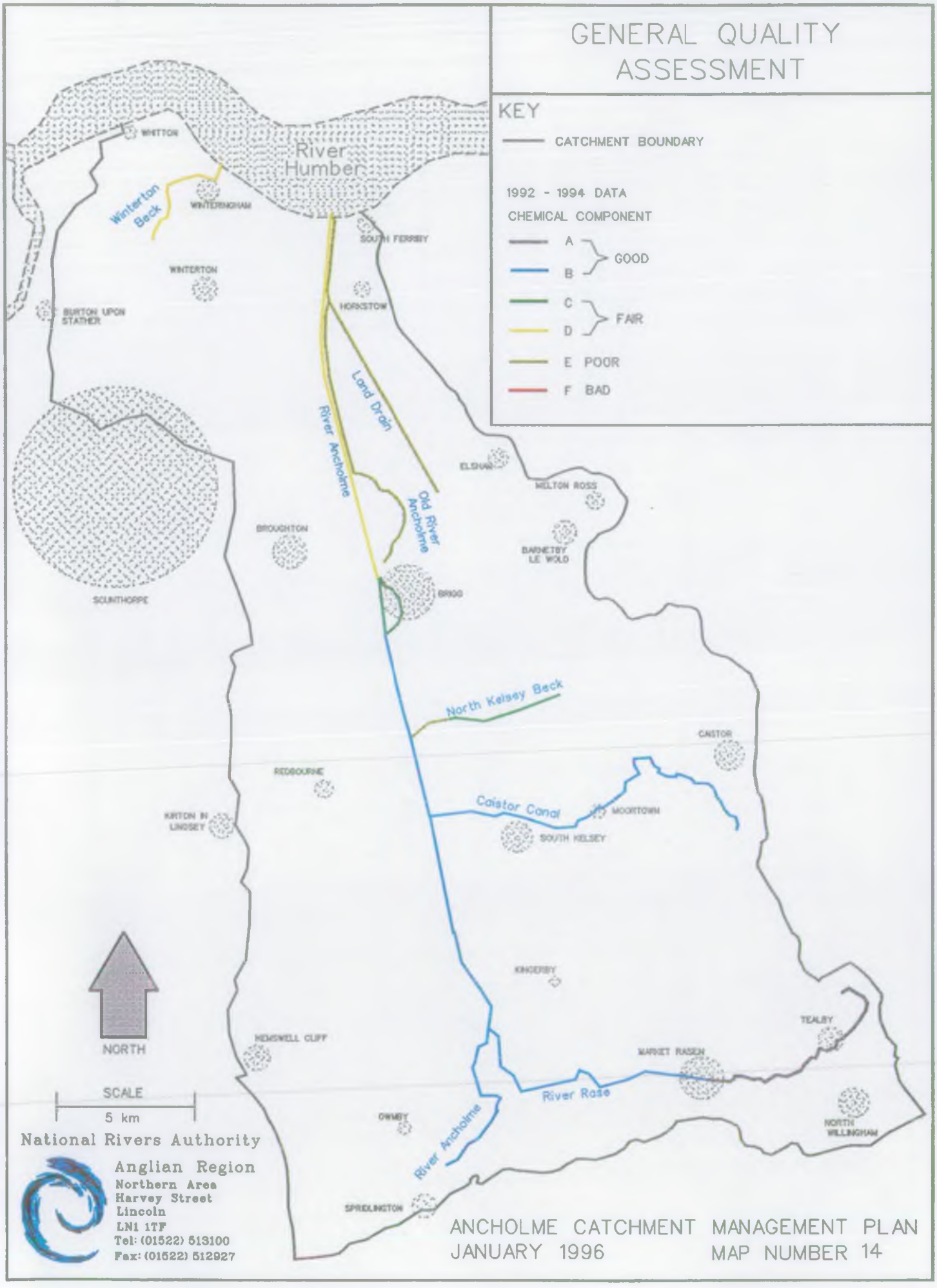
MAP 15 SHOWS THE BIOLOGICAL ASSESSMENT DATA FOR 1994. It indicates generally good quality throughout the Catchment with the exception of the Old River Ancholme and Land Drain which largely supports the Chemical GQA Data.

4.2.2.3 Eutrophication

A general water quality concern within the Catchment is that of eutrophication. Eutrophication is the enrichment of water by nutrients, causing an accelerated growth of algae and higher forms of plant life to produce an undesirable disturbance to the balance of organisms present in the water and to the quality of the water concerned. Sources of nutrients can be from both agricultural land and sewage treatment works.

In common with other deep, slow moving rivers in the Area, the Ancholme Catchment also exhibits the effects of eutrophic conditions. The impact on the Lower Ancholme itself is less pronounced due to the flow that is maintained by the Trent Witham Ancholme (TWA) Scheme. The slow moving nature of the Old River Ancholme downstream of Brigg and the Land Drain in the east of the Catchment contributes to these watercourses falling into the poor grade (Grade E) of the GQA Scheme.

Appendix 5 shows the principles of Eutrophication


GENERAL QUALITY ASSESSMENT
KEY
CATCHMENT BOUNDARY
1992 - 1994 DATA
CHEMICAL COMPONENT
A
B
GOOD
C
D
FAIR
E POOR
F BAD
River Humber
WHITTON
Winterton Beck
WINTERINGHAM
SOUTH FERRIBY
WINTERTON
BURTON UPON STATHER
HORKSTOW
Land Drain
River Ancholme
Old River Ancholme
ELSHAM
MELTON ROSS
BARNETBY LE WOLD
BROUGHTON
SCUNTHORPE
BRIGG
North Kelsey Beck
CASTOR
REDBOURNE
Caistor Canal
MOORTOWN
KIRTON IN LINDSEY
SOUTH KELSEY
KINGERBY
TEALBY
HEMSWELL CLIFF
MARKET RASEN
River Rase
OWMBY
River Ancholme
NORTH WILLINGHAM
SPRIDLINGTON
NORTH
SCALE
5 km
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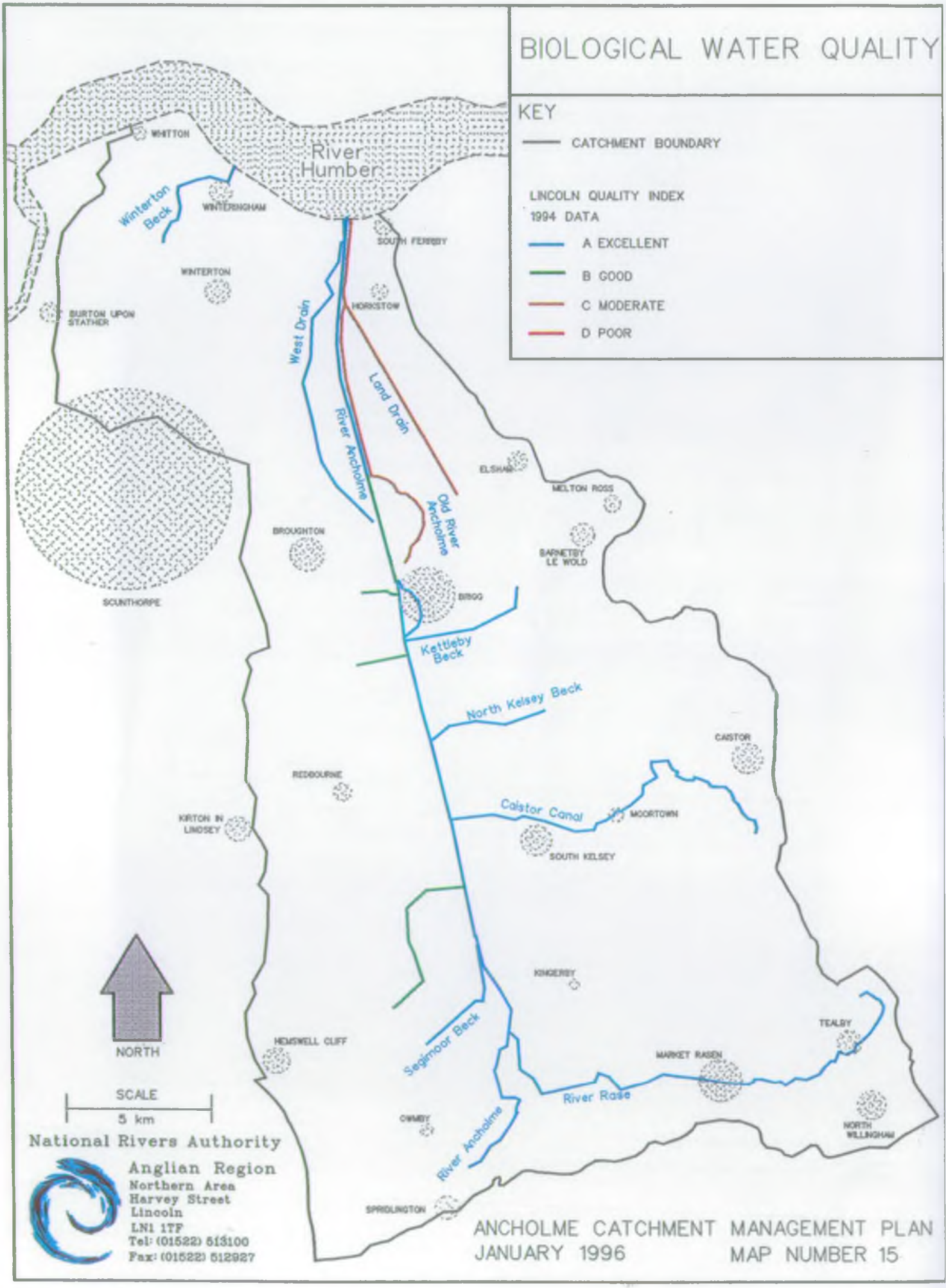
BIOLOGICAL WATER QUALITY
KEY
CATCHMENT BOUNDARY
LINCOLN QUALITY INDEX
1994 DATA
A EXCELLENT
B GOOD
C MODERATE
D POOR
River Humber
WHITTON
Winterton Beck
WINTERINGHAM
SOUTH FERRIBY
WINTERTON
HORKSTOW
BURTON UPON STATHER
West Drain
Land Drain
River Ancholme
Old River Ancholme
ELSHAM
MELTON ROSS
BROUGHTON
BARNETBY LE WOLD
SCUNTHORPE
BIGGG
Kettleby Beck
North Kelsey Beck
CAISTOR
REDBOURNE
Caistor Canal
MOORTOWN
KIRTON IN LINDSEY
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4.2.2.4 Trent Witham Ancholme Scheme

The TWA Scheme provides water quality benefits to the Ancholme Catchment. The transfer of water during the summer period enables the River Ancholme to maintain a positive flow to tide which reduces the effect of eutrophication and also reduces the ingress of saline water into the system.

The quality of water abstracted from the River Trent is continuously monitored by an Automatic Water Quality Monitor, which is linked by telemetry to an NRA 24hr Control Room. Any significant decline in water quality can therefore be swiftly reported and, if necessary, the abstraction stopped.

4.2.2.5 Public Water Supply Intake

Water is abstracted at Cadney by AWS for public water supply and industrial use. Raw water is stored at Cadney and pumped to Elsham Water Treatment Works. There have been a number of occasions when abstraction has ceased due to low level intermittent pollution from unknown sources.

4.2.2.6 Saline Ingress

The quality of the lower reaches of the Ancholme, Land Drain, and West Drain can be adversely affected by saline ingress through tidal structures. This may affect the suitability of these watercourses for spray irrigation, industrial and potable use and if unchecked would affect both fauna and flora.

To manage this problem on the River Ancholme, the NRA has installed two 'bubble curtains' to limit the movement of salt water upstream and revised its operating procedures for the lock at South Ferriby. During periods of low flow, saline ingress is also limited by operation of the Trent Witham Ancholme Transfer which reduces saline ingress by maintaining a positive flow to tide.

Salinity is observed by a continuous monitor at Saxby, this information assists in determining how much water is transferred.

4.2.2.7 Inadequate Sewage Disposal Systems

A number of small watercourses and ditches within the Catchment suffer from localised pollution due to inadequate village sewage disposal systems. Such problems manifest themselves in terms of their smell and appearance. These problems are difficult to resolve because of the cost to individual property owners and/or the sewage undertaker can be prohibitive.

In addition there are a number of minor unsatisfactory sewer overflows within the catchment which cause localised pollution and have been identified for improvement by AWS in their Asset Management Plan.

4.2.2.8 Winterton Beck

The upper reaches of the Winterton Beck flows through an old blast furnace site. Downstream, water quality is affected by high pH levels and the bed of the watercourse is seasonally affected by a white precipitate.

4.2.2.9 West Drain

The West Drain at South Ferriby is affected by an industrial discharge causing increased pH levels. The visual appearance of the watercourse is affected. The site is Authorised by HMIP and an improvement plan has been put in place.

4.2.2.10 Pollution Incidents

The number of reported pollution incidents within the Catchment from 1991 - 1994 is as follows:

1991 - 56

1992 - 44

1993 - 36

1994 - 58

Although the downward trend was reversed in 1994, probably due to increased public awareness and the introduction of the Emergency Freephone Service (0800 807060), the incidence of serious pollution is declining.

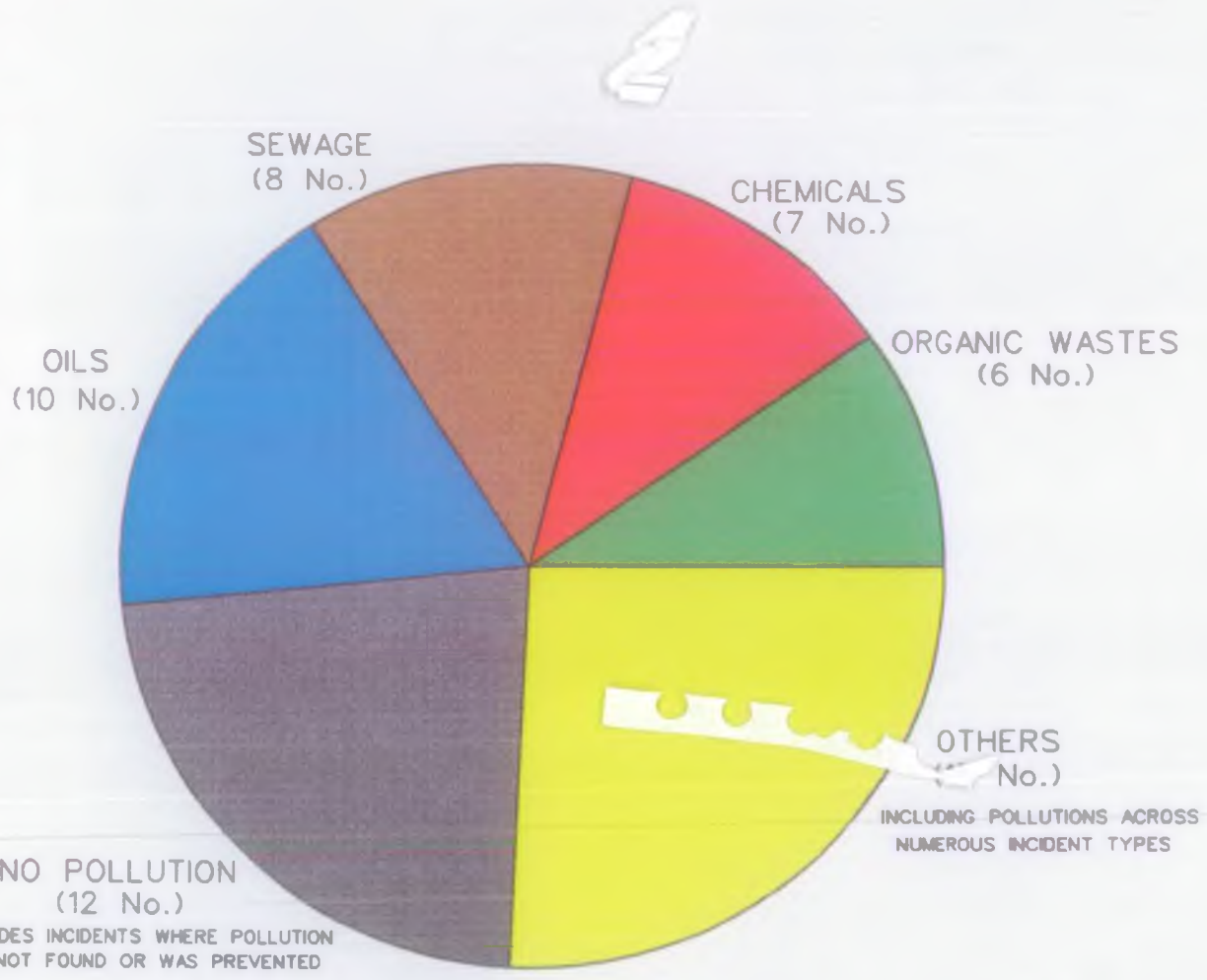
Of particular concern, however, is the high number of oil related pollutions. Figure 4 gives a breakdown of pollution type for 1994.

The NRA is currently conducting pollution prevention campaigns within the Catchment.

4.2.2.11 Hibaldstow Airfield Tyre Dump

This airfield, in the recent past, has been used to store huge numbers of used tyres. This presented a potential threat to water quality in terms of the possible implications of water used in firefighting becoming contaminated and entering controlled waters. However, the use of the airfield for this purpose has been discontinued and the number of tyres stored is reducing rapidly. This is therefore not considered to be an issue during the lifetime of this Catchment Management Plan.

REPORTED POLLUTION INCIDENTS 1994



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4.2.2.12 Nitrates

Agricultural activities within the southern part of the Catchment have led to the presence of high nitrate concentrations in surface waters and groundwaters. In places, nitrate concentrations exceed 50 mgl^{-1} which is the EC Drinking Water Directive and Surface Water Directive limit. The EC Nitrate Directive requires compulsory controls in areas where nitrate levels exceed the EC limit or are at risk of doing so. There are 72 areas currently being considered throughout England and Wales for designation as Nitrate Vulnerable Zones (NVZ's), the Northern Lincolnshire Wolds is one such zone. In NVZ's farmers will be required to comply with good agricultural practice, additional agricultural constraints are currently being considered by the Government.

Changes in farming practice throughout the NVZs are expected to lead to water quality improvements by reducing nitrate leaching. The NVZs are envisaged as long-term solutions to halt and reverse rising nitrate levels.

THE LOCATION OF PROPOSED NITRATE VULNERABLE ZONES WITHIN THE CATCHMENT ARE SHOWN ON MAP NO. 18

4.2.2.13 Waste Disposal Sites

There are an unusually large number of waste disposal (landfill) sites within the Catchment, utilizing gullets excavated during the mining of iron ore. Leachate, produced by the decomposition of waste, is highly polluting if it enters either surface or groundwaters. Water quality has been adversely affected in the past due to this activity and prevention of similar incidents in the future is a priority for this Catchment.

4.2.3 River Quality Objectives

The NRA has set Water Quality Targets for the Ancholme Catchment. These targets are known as River Quality Objectives (RQOs). They are used for planning the management of river quality. RQOs establish a defined level of protection for aquatic life. Achieving these will help sustain the use of rivers for recreation, fisheries and wildlife, and protect the interests of abstractors. RQOs provide a basis for setting consents to discharge effluents into rivers, and guide decisions on the NRA's other actions to control and prevent pollution. The Water Quality Classification Scheme used to set RQO Planning Targets is known as the River Ecosystem Scheme. Until formally established these are being used on a non statutory basis.

4.2.3.1 The River Ecosystem Scheme

The River Ecosystem (RE) Scheme provides a nationally consistent basis for setting RQOs. The scheme comprises five classes which reflect the chemical quality requirements of communities of plants and animals occurring in our rivers. The standards defining these classes reflect differing degrees of pollution by organic matter and other common pollutants.

River Ecosystem Classes can be summarised as follows:

RE1 Water of very good quality suitable for all fish species

RE2 Water of good quality suitable for all fish species

RE3 Water of fair quality suitable for high coarse fish populations

RE4 Water of fair quality suitable for coarse fish populations

RE5 Water of poor quality which is likely to limit coarse fish populations

Appendix 6 shows the chemical standards used to define these classes.

MAP No. 16 shows the long term RE Target Classes that have been set for the Ancholme Catchment. These have been translated from existing River Quality Objectives for the Catchment which were consulted upon locally and set in the late 1970s/early 1980s. Current water quality data obtained from three years routine chemical monitoring has been used to assess current compliance with these RE targets.

SIGNIFICANT AND MARGINAL FAILURES AGAINST THE PROPOSED LONG TERM RE TARAGETS ARE SHOWN ON MAP NO. 16

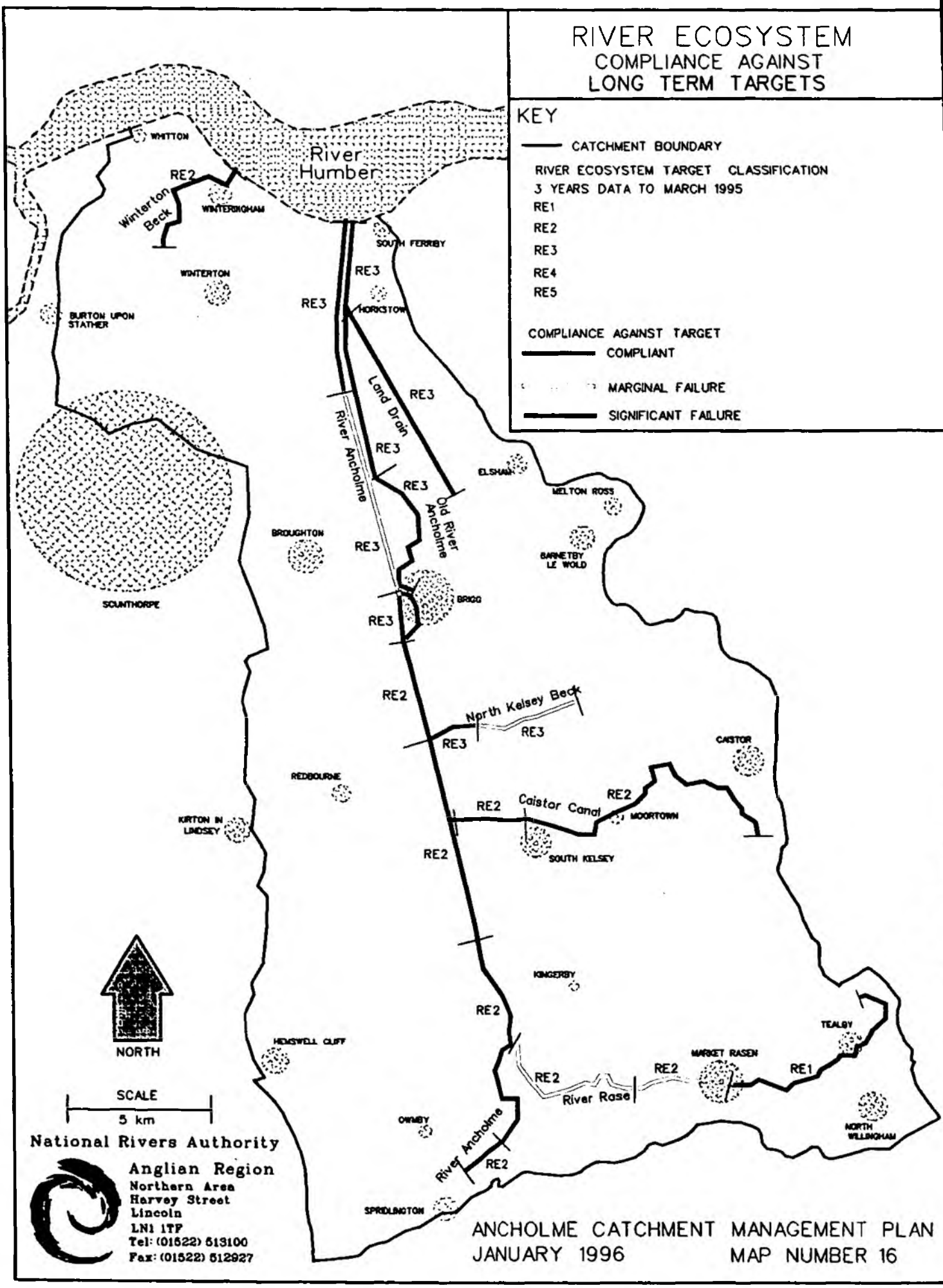
With regard to the marginally non compliant stretches of the Ancholme, North Kelsey Beck and the Rase, all exhibit good biological quality and therefore it is not proposed to take any specific action in respect of these failures. However monitoring will continue.

With regard to those failures associated with the Winterton Beck and Old River Ancholme, examination of the data used to assess compliance suggests that a number of sample results are unrepresentative of the normal results expected for a particular sample point. Unrepresentative data can arise from a variety of different sources (drought, the affect of algal activity, exceptional weather and pollution incidents), and are largely beyond the control of the NRA. Single exceptional results on the Winterton Beck and the Old River Ancholme account for the significant failures on these stretches. Positive remedial action to secure compliance with the RE targets (along with other marginally non-compliant stretches) may not therefore to be necessary in the longer term.

In the case of the small section of the North Kelsey Beck and the Land Drain, it has not been possible to identify the reasons for failures against RE targets. Problems appear to be associated with dissolved oxygen levels and the Land Drain also has an intermittent BOD problem. There are no known significant discharges into these stretches.

For the North Kelsey Beck, Land Drain and Old River Ancholme it is proposed that short-term RE targets are set, reflecting current quality, pending an investigation into the causes of non-compliance, and until clear actions can be identified which will deliver the necessary water quality improvements to these watercourses.

SHORT TERM RE TARGETS ARE SHOWN ON MAP NO. 17


RIVER ECOSYSTEM
COMPLIANCE AGAINST
LONG TERM TARGETS
KEY
CATCHMENT BOUNDARY
RIVER ECOSYSTEM TARGET CLASSIFICATION
3 YEARS DATA TO MARCH 1995
RE1
RE2
RE3
RE4
RE5
COMPLIANCE AGAINST TARGET
COMPLIANT
MARGINAL FAILURE
SIGNIFICANT FAILURE
River Humber
WHITTON
Winterton Beck
WINTERINGHAM
WINTERTON
BURTON UPON STATHER
SOUTH FERRIBY
HORKSTOW
Land Drain
River Ancholme
Old River Ancholme
ELSHAM
MELTON ROSS
BARNETBY LE WOLD
BROUGHTON
SCUNTHORPE
BRIGG
North Kelsey Beck
CAISTOR
REDBOURNE
KIRTON IN LINDSEY
Caistor Canal
MOORTOWN
SOUTH KELSEY
KINGERBY
TEALBY
HEMSWELL CLIFF
MARKET RASEN
River Rase
NORTH WILLINGHAM
OWMBY
SPRIDLINGTON
NORTH
SCALE
5 km
National Rivers Authority
Anglian Region
Northern Area
Harvey Street
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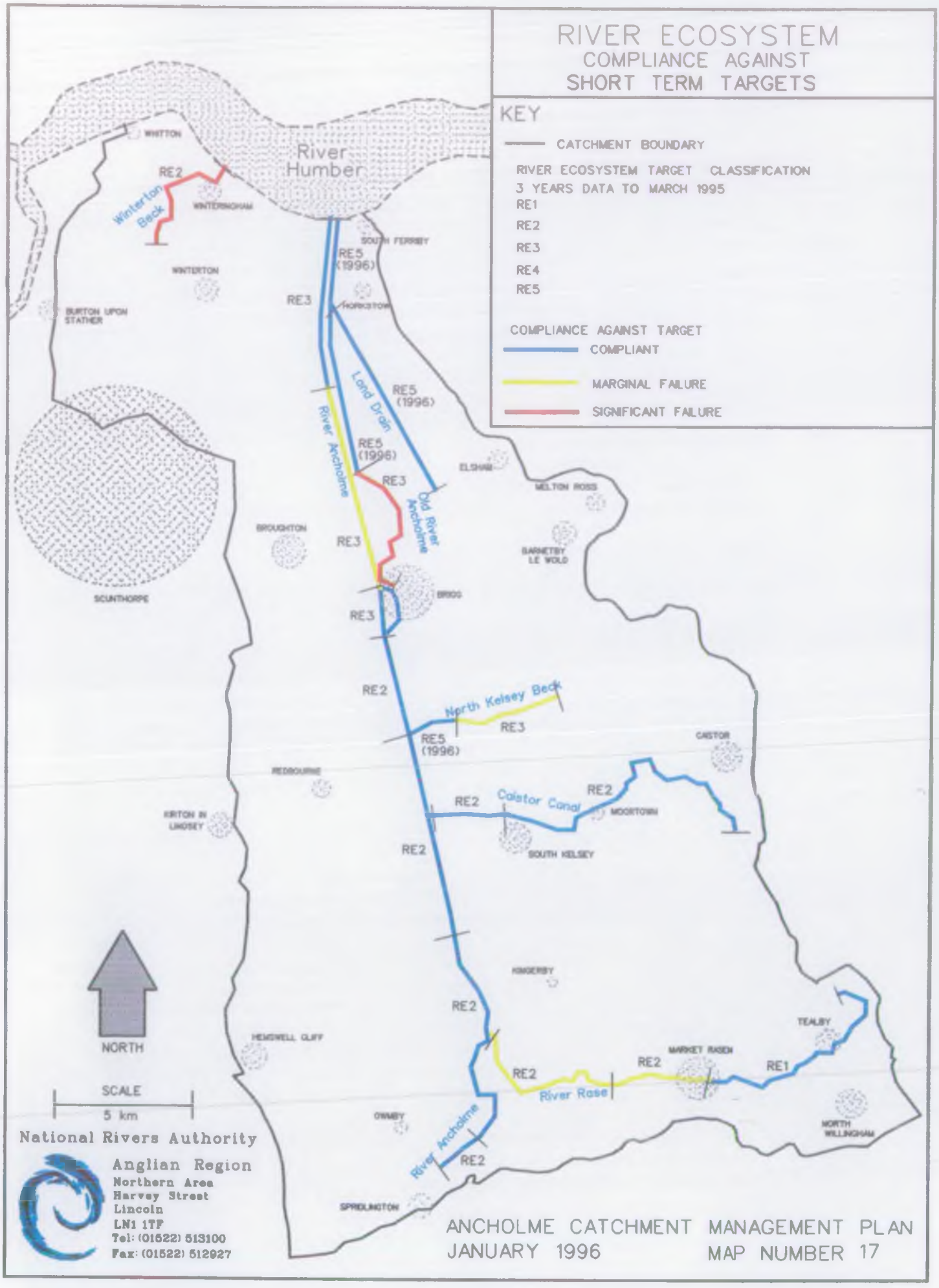
RIVER ECOSYSTEM
COMPLIANCE AGAINST
SHORT TERM TARGETS
KEY
CATCHMENT BOUNDARY
RIVER ECOSYSTEM TARGET CLASSIFICATION
3 YEARS DATA TO MARCH 1995
RE1
RE2
RE3
RE4
RE5
COMPLIANCE AGAINST TARGET
COMPLIANT
MARGINAL FAILURE
SIGNIFICANT FAILURE
River Humber
WHITTON
RE2
Winterton Beck
WINTERINGHAM
SOUTH FERRIBY
RE5 (1996)
WINTERTON
RE3
BURTON UPON STATHER
HORKSTOW
Land Drain
RE5 (1996)
River Ancholme
RE5 (1996)
RE3
ELSHAM
MELTON ROSS
Old River Ancholme
BROUGHTON
RE3
BARNETBY LE WOLD
SCUNTHORPE
BRIGG
RE3
RE2
North Kelsey Beck
RE3
RE5 (1996)
CASTOR
REDBOURNE
RE2
Caistor Canal
RE2
MOORTOWN
KIRTON IN LINDSEY
RE2
SOUTH KELSEY
KIRMERBY
RE2
TEALBY
HEMSWELL CLIFF
MARKET RASEN
RE2
RE1
RE2
River Rase
OWMBY
River Ancholme
NORTH WILLINGHAM
RE2
SPRIDLINGTON
NORTH
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4.2.4 Statutory Objectives under EC Directives

Designations of river stretches, or points on rivers under the EC Dangerous Substances Directive(76/464/EEC), the EC Surface Water Abstraction Directive (75/440/EEC) and the EC Fisheries Directive (78/659/EEC) already constitute statutory objectives. Rivers are monitored downstream of effluent discharges known to contain "Dangerous Substances". Standards are set at European Community level and apply to all member states. Compliance is assessed against the relevant standards and reported to the DoE on a calendar year basis.

Statutory objectives for Dangerous Substances apply to all river stretches and are aimed at protecting aquatic life. The EC Surface Water Abstraction Directive and the EC Fisheries Directive apply to designated points on rivers, and in reservoirs and river stretches. In the Ancholme Catchment compliance with the Fisheries and Dangerous Substances Directives at monitored sample points has been achieved since 1993.

Compliance with the Surface Water Directive was not achieved at AWS's public water supply intake works at Cadney in 1992 and 1993 due to high nitrate concentration, and in 1994 due to high nitrate concentrations and an apparent phenol failure (the phenol failure is considered to be due to analytical difficulties).

Appendix 7 lists relevant EC Directives.

COMPLIANCE AGAINST EC DIRECTIVES IS SHOWN ON MAP NO 18

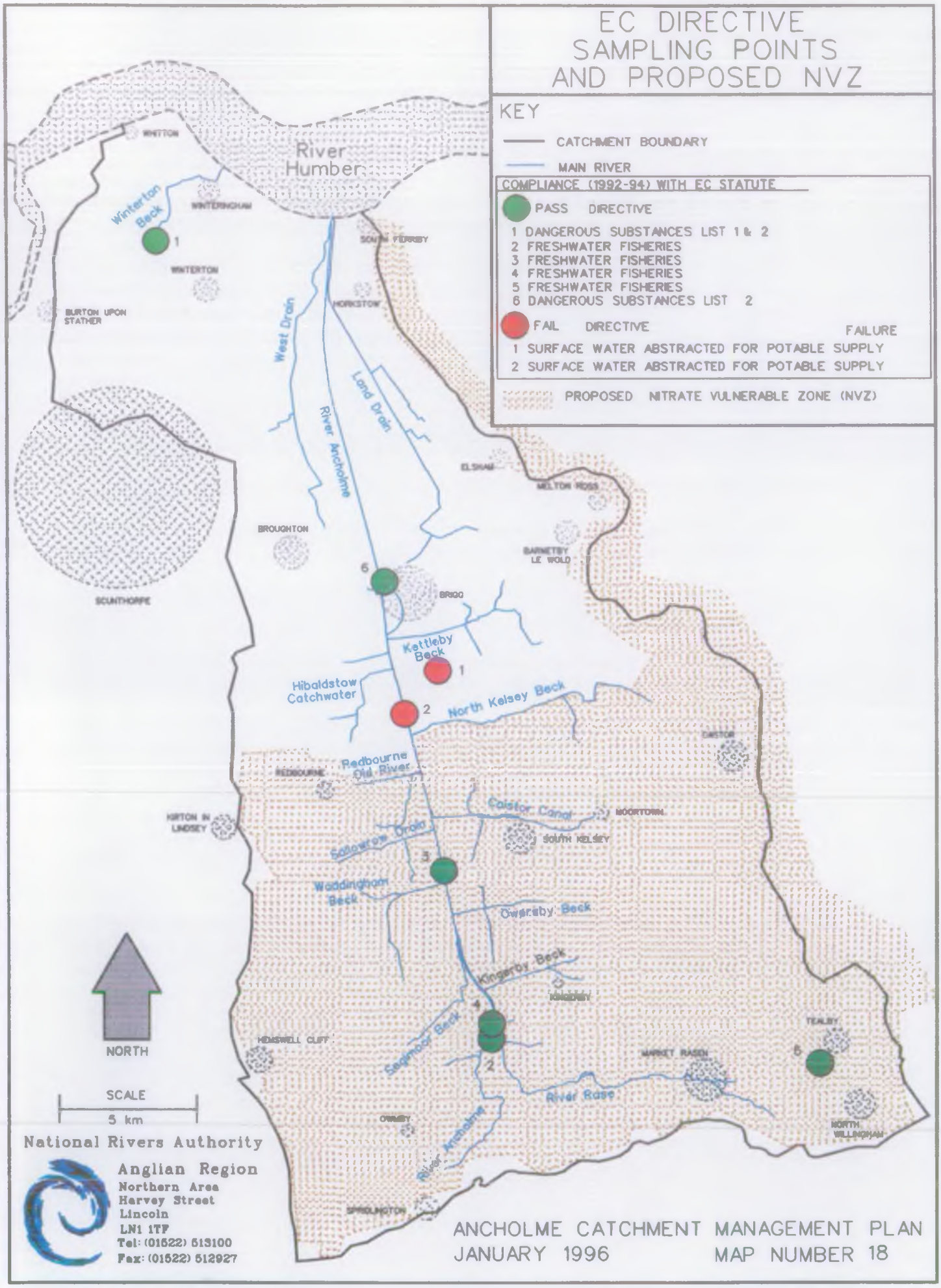
4.3 FLOOD DEFENCE

The catchment of the River Ancholme is bounded by the chalk wolds to the east and the Lincolnshire limestone ridge to the west. Beyond the southern boundary of the catchment the land falls away to the Barlings Eau system and the River Witham valley. The South Humber Bank provides the northern boundary to the catchment. The base of the Ancholme valley lies below high tide level in the River Humber from Ferriby to Bishopbridge and is protected from flooding by tidal defences.

4.3.1 Fluvial Defences

Within the Catchment - apart from a small number of upland watercourses, two distinct types of drainage systems exist, both of which are entirely artificial. The main arterial watercourses which carry highland water across the low lying valley floor have been constructed with raised banks. The Ancholme discharges into the Humber through the South Feriby Sluice which prevents tidal waters from entering the freshwater system. Between Brigg and South Ferriby, highland water from the valley sides is collected by the catchwater drain systems of East Drain and West Drain. Both of these drains discharge to the Humber via independent tidal sluices provided with timber pointing doors, also at South Ferriby. As well as containing flood flows these embanked channels also provide channel storage under tide lock conditions. These arterial watercourses are maintained by the NRA.

Land drainage and flood protection in the lowland areas is provided by a network of drains maintained by the Ancholme Internal Drainage Board. The IDB pump some of their waters into the River Ancholme. Along the coastal fringe the


EC DIRECTIVE
SAMPLING POINTS
AND PROPOSED NVZ
KEY
CATCHMENT BOUNDARY
MAIN RIVER
COMPLIANCE (1992-94) WITH EC STATUTE
PASS DIRECTIVE
1 DANGEROUS SUBSTANCES LIST 1 & 2
2 FRESHWATER FISHERIES
3 FRESHWATER FISHERIES
4 FRESHWATER FISHERIES
5 FRESHWATER FISHERIES
6 DANGEROUS SUBSTANCES LIST 2
FAIL DIRECTIVE FAILURE
1 SURFACE WATER ABSTRACTED FOR POTABLE SUPPLY
2 SURFACE WATER ABSTRACTED FOR POTABLE SUPPLY
PROPOSED NITRATE VULNERABLE ZONE (NVZ)
River Humber
Winterton Beck
WINTERTON
BURTON UPON STATHER
SCUNTHORPE
SOUTH FERRIBY
HORKSTOW
West Drain
River Ancholme
Land Drain
ELSHAM
MELTON ROSS
BARNETBY LE WOLD
BROUGHTON
BRIGG
Kettleby Beck
Hibaldstow Catchwater
North Kelsey Beck
Redbourne Old River
REDBOURNE
CAISTOR
KIRTON IN LINDSEY
Caistor Canal
MOORTOWN
SOUTH KELSEY
Saltergate Drain
Waddingham Beck
Owmsby Beck
Kingerby Beck
KINGERBY
HEMSWELL CLIFF
Stainton Beck
TEALBY
MARKET RASEN
River Rase
OWMBY
River Ancholme
NORTH WILLINGHAM
SPRINGTHORPE
NORTH
SCALE
5 km
National Rivers Authority
Anglian Region
Northern Area
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MAP NUMBER 18

Ancholme IDB maintain 5 gravity outfalls which discharge lowland water into the Humber.

Winterton Beck drains a small catchment area bounded to the east by the Lincolnshire limestone ridge and to the west by the ironstone ridge; it outfalls into the Humber at Winteringham. The Winterton Beck has been diverted on several occasions to accommodate iron ore mining operations and now occupies an artificial channel on the west side of the original valley.

Routine maintenance of the main river system for flood defence purposes is carried out with an annual budget of approximately £190k. The largest single item of expenditure is weed control work ie the cutting and removal from the channel of vegetation which would otherwise obstruct flows. This could cause increased water levels and ultimately flooding during periods of high flow. Weed control in main rivers costs £55,000 per year and is carried out by means of hydraulic excavators, weed cutting boats and hand tools.

Other maintenance works include grass cutting on raised embankments, repair and operation of sluices, dredging of accumulated silt, bank repair and stabilisation, removal of obstructions to flow, vermin control and bridge maintenance.

Current standards of flood protection are provided in accordance with NRA standards of service and guidelines set by MAFF.

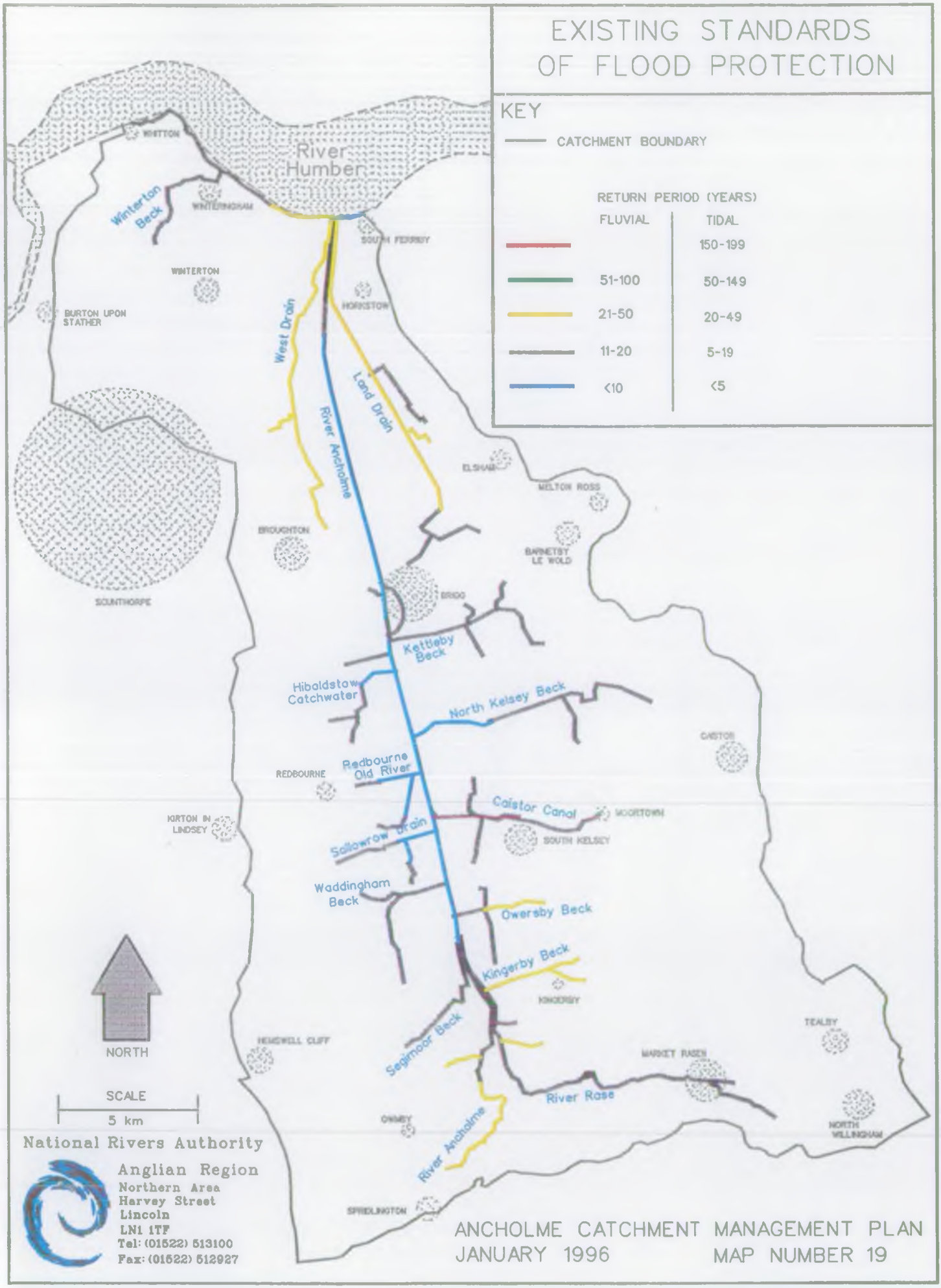
CURRENT STANDARDS OF DEFENCE AND OTHER FLOOD DEFENCE CONCERNS ARE SHOWN ON MAPS NO 19 AND 20.

There is concern regarding these standards for the River Rase between Market and Middle Rasen and along lengths of the Ancholme and it's embanked tributaries:

The River Rase drains the south eastern corner of the Catchment Plan area through the town and villages of Market Rasen and Middle and West Rasen.High flows in the River Rase caused extensive flooding to roads and properties in Market, Middle and West Rasen in April 1981 and to a lesser degree in October 1993. A feasibility study into flood defences on the Rase has identified a current standard of protection of around 1 in 20 years. Proposed flood defence improvement works will raise the standard of protection to at least 1 in 50 years and are planned for 1995/96 and 96/97.

The current standard of protection for certain lengths of the River Ancholme and its tributaries between Harlam Lock and South Ferriby are as low as 1 in 7 years. This has arisen as a consequence of changes in the catchment's drainage characteristics. Increased surface water run-off as a result of development and changes in agricultural drainage systems, embankment instability due to seepage through the embankments and erosion of the riverside berm have all impacted upon standards of protection.

In April 1981 a major flooding event in the Ancholme Valley resulted in 2,600 hectares of agricultural land being flooded for periods of up to 6 weeks. The flooding resulted from a combination of overtopping and breaches in embankments.


EXISTING STANDARDS OF FLOOD PROTECTION
KEY
CATCHMENT BOUNDARY
RETURN PERIOD (YEARS)
FLUVIAL
TIDAL
150-199
51-100
50-149
21-50
20-49
11-20
5-19
<10
<5
River Humber
Winterton Beck
WINTERTON
WINTERINGHAM
SOUTH FERRIBY
BURTON UPON STATHER
HORKSTOW
West Drain
Land Drain
River Ancholme
ELSHAM
MELTON ROSS
BROUGHTON
BARNETBY LE WOLD
SCUNTHORPE
BRIGG
Kettleby Beck
Hibaldstow Catchwater
North Kelsey Beck
CAISTOR
REDBOURNE
Redbourne Old River
Caistor Canal
MOORTOWN
KIRTON IN LINDSEY
Sallowrow Drain
SOUTH KELSEY
Waddingham Beck
Owersby Beck
Kingerby Beck
KINGERBY
TEALBY
HEMSWELL CLIFF
Segimoor Beck
MARKET RASEN
River Rase
NORTH WILLINGHAM
OWMBY
River Ancholme
SPRINGTHORPE
NORTH
SCALE
5 km
National Rivers Authority
Anglian Region
Northern Area
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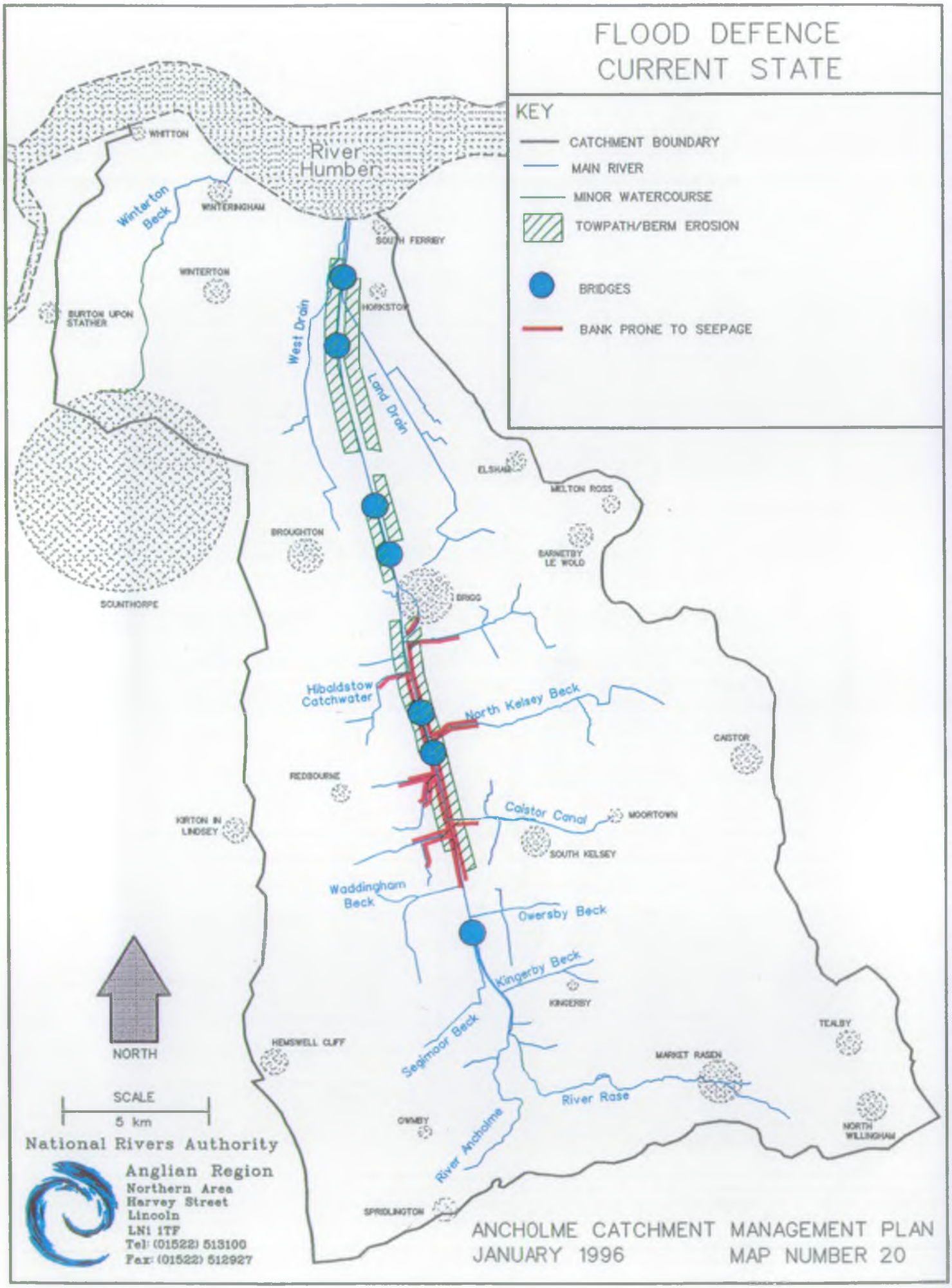
JANUARY 1996
MAP NUMBER 19


FLOOD DEFENCE
CURRENT STATE
KEY
CATCHMENT BOUNDARY
MAIN RIVER
MINOR WATERCOURSE
TOWPATH/BERM EROSION
BRIDGES
BANK PRONE TO SEEPAGE
River Humber
WHITTON
WINTERINGHAM
Winterton Beck
WINTERTON
BURTON UPON STATHER
SOUTH FERRIBY
HORKSTOW
West Drain
Land Drain
ELSHAM
MELTON ROSS
BARNETBY LE WOLD
BROUGHTON
SCUNTHORPE
BRIGG
Hibaldstow Catchwater
North Kelsey Beck
CAISTOR
REDBOURNE
KIRTON IN LINDSEY
Caistor Canal
MOORTOWN
SOUTH KELSEY
Waddingham Beck
Owersby Beck
Kingerby Beck
KINGERBY
TEALBY
HEMSWELL CLIFF
Segimoor Beck
MARKET RASEN
River Rase
NORTH WILLINGHAM
OWMBY
River Ancholme
SPRIDLINGTON
NORTH
SCALE
5 km
National Rivers Authority
Anglian Region
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Ancholme Valley flood defence improvements are now in the capital programme for 1996 to 1998 and a feasibility study was commenced in July 1995.

Localised land drainage problems occur in watercourses outside internal drainage districts caused by piecemeal development, inadequate maintenance and the occasional unauthorised culverting of watercourses. The riparian owners who are responsible to maintain the flow of these watercourses may be either unaware, unwilling or unable to undertake their responsibilities. Examples of such problems occur in Redbourne and Owmby

The needs of the IDB to maintain its gravity outfalls into the Ancholme and those of the NRA to manage river levels for abstraction purposes are at times incompatible.

The normal retention level in the River Ancholme is 1.2m ODN during the summer months and 0.90 metres ODN during the winter. The Ancholme Internal Drainage Board have numerous gravity outfalls into the Ancholme, the vast majority of which are submerged when the level in the Ancholme is at or above 0.9m.

Until the early 1990s it was normal practice for the NRA to lower the level of the River Ancholme to +0.15m ODN for a 2 to 3 week period each year during the winter months to allow the IDB to maintain their gravity outfalls. The NRA took advantage of this period of low water levels to carry out bank maintenance and survey works. In recent years, as a result of the need to manage the river more effectively for abstraction purposes, and also because of environmental concerns, the NRA adjusted this practice and now lower the level during this period to +0.04m ODN. As a consequence the IDB are now unable to properly maintain 12 of their outfall structures.

When the River Ancholme was improved in the 1840's, 10 new bridges were constructed to carry public access routes across the widened channel. Of these 10 structures, 2 have been adopted by the Highway Authority (at Brigg and Brandy Wharf) and Minnitts Bridge at North Kelsey was demolished in the 1950's.

The maintenance of the remaining 7 bridges at Horkstow, Saxby, Broughton, Castlethorpe, Cadney, Hibaldstow and Snitterby is the responsibility of the NRA.

All of these bridges have timber decks and six are Grade II listed structures. In addition to having foot-paths or bridleways crossing them, adjacent landowners have rights to access over the bridges for farm vehicles.

Analysis of the load bearing capacity of the bridges by modern codes of practice has resulted in them being classified as unsuitable for vehicular traffic.

4.3.2 Tidal Defences

The Ancholme and Winterton Beck valleys are protected against tidal flooding by earth embankments between the chalk cliffs at South Ferriby in the east and the high ground at Whitton in the west.

The Ancholme Valley is below highest tide levels as far inland as Bishopbridge, some 30km from South Ferriby.

The target standard of service for the tidal defences along the Plan frontage is 1 in 50 years. That is to say that events up to 1 in 50 years return period might be expected to overtop the defences with occasional wave spray, causing no substantial damage. Events much greater than 1 in 50 year return period would result in a great deal more overtopping which might lead to a breach of the tidal defences.

The Humber Estuary Tidal Defence Strategy completed in 1995 determined that the existing standard of defence along the Ancholme Catchment Management Plan frontage varies from between less than 1 in 5 years to 1 in 50 years (See Map No.19). Other isues identified in that Plan relevant to this catchment include those of rising sea levels and changing sedimentary (and erosional) processes.

These issues were addressed in the Humber Estuary CMP (see section 2.2) the Action Plan for which resolved:-

- to prepare an holistic strategy to provide effective and sustainable Tidal Defences;
- to undertake urgent works at Winteringham, Whitton and South Ferriby in advance of the Estuary wide strategy;
- to undertake a geomorphological study of the Estuary;
- to review current land drainage practices to address the issue of siltation in Tidal Outfalls.

The EC Habitats Directive will have implications for flood defence works in certain statutory areas.

4.3.3 Flood Warning

The Catchment includes some areas which in severe events are at risk of tidal and fluvial inundation. The NRA operates a flood warning service whereby the police, councils and media are advised of areas likely to be affected by flooding. These warnings are phased to indicate the severity of the event and its impact on land and property. To be effective, warnings need to be timely and accurate. Warnings are based upon forecasts utilising data on rainfall, river flow, river level and tide monitoring systems. A Regional telemetry system (ARTS) has recently been commissioned and will improve the reliability and accuracy of warnings provided. Further enhancements to the ARTS system will enable greater refinement to the quality of warning available, particularly at Market Rasen in this Catchment where the time between a rainfall event and the peak flow in the Rase is very short.

4.4 FISHERIES

The Ancholme is an example of a typical lowland course fishery. The mean fish biomass is high, reflecting the rich productive nature of its waters.

Surveys undertaken in 1993 indicate that the Ancholme fish population currently stands at the highest recorded average biomass since sampling work began and representing an increase of 23% since 1989. However fish species richness is low in certain locations.

The dominant species found are roach and bream. Ageing studies have shown that 82.5% of the fish population is below 5 years old. This reflects the nature of the fishery where warm, shallow, rich waters result in ideal conditions for juvenile cyprinid survival and growth.

The River Rase currently supports a mean fish biomass which is lower than might be expected from this water. A decline since 1989 has been observed, which could be attributed to loss of habitat and the recent drought period when many small watercourses were adversely affected by low flow conditions. Fish species known to be present include brown trout, dace, stoneloach, gudgeon and chub. Other species present include eel and stickleback.

The Winterton Beck Land Drain and West Drain currently supports a low mean fish biomass which equates to CLASS D/E . Species present include chub, dace, roach, perch, tench and eel.Species diversity is also low on these rivers.

Throughout the catchment there are several stillwater fisheries that provide popular angling opportunities. Some of these are run in conjunction with caravan holiday parks and provide important tourist facilities for the area.

A commercial eel fishery occurs in the catchment on the main river Ancholme, some of the major tributaries and on some still waters.

TOTAL FISH BIOMASS AND SPECIES RICHNESS ARE SHOWN ON MAP NOS. 21 AND 22

4.5 RECREATION

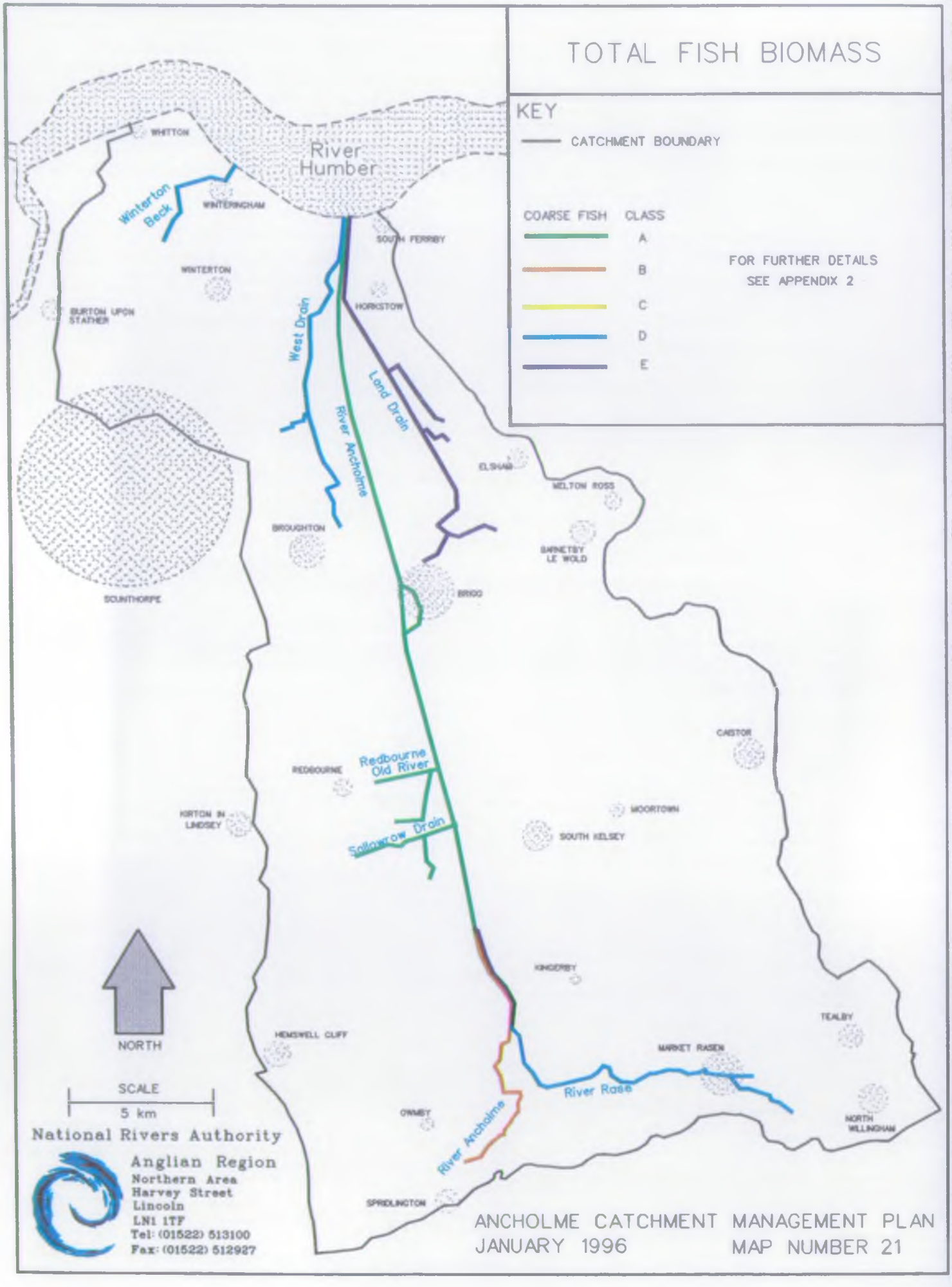
Recreational use of the River Ancholme is high with many local groups and individuals taking advantage of opportunities presented by this river system. The many users who function on this river meet twice a year as the Ancholme Users Group to discuss issues and contribute to the management of this recreational resource.

4.5.1 Angling

Angling carried out for both match and pleasure purposes is very popular and enjoys considerable support from both local and visiting fishermen. The Scunthorpe Angling Association control the fishing rights by lease from the National Rivers Authority. Regular matches are organised by the club and catches reflect the high status in which this fishery is held by anglers.

4.5.2 Access

The National Rivers Authority has constructed special access points that enable disabled anglers to fish this river with ease. Elsewhere the limited access to rivers and growing demand has resulted in a number of problems between user groups, landowners and the NRA e.g. bank erosion, disturbance and parking problems.


TOTAL FISH BIOMASS
KEY
CATCHMENT BOUNDARY
COARSE FISH CLASS
A
B
C
D
E
FOR FURTHER DETAILS SEE APPENDIX 2
River Humber
WHITTON
Winterton Beck
WINTERINGHAM
WINTERTON
BURTON UPON STATHER
SOUTH FERRIBY
HORKSTOW
West Drain
River Ancholme
Land Drain
ELSHAM
MELTON ROSS
BROUGHTON
BARNETBY LE WOLD
BRIGG
SCUNTHORPE
CAISTOR
REDBOURNE
Redbourne Old River
MOORTOWN
KIRTON IN LINDSEY
Sallowrow Drain
SOUTH KELSEY
KINGERBY
TEALBY
HEMSWELL CLIFF
MARKET RASEN
River Rase
NORTH WILLINGHAM
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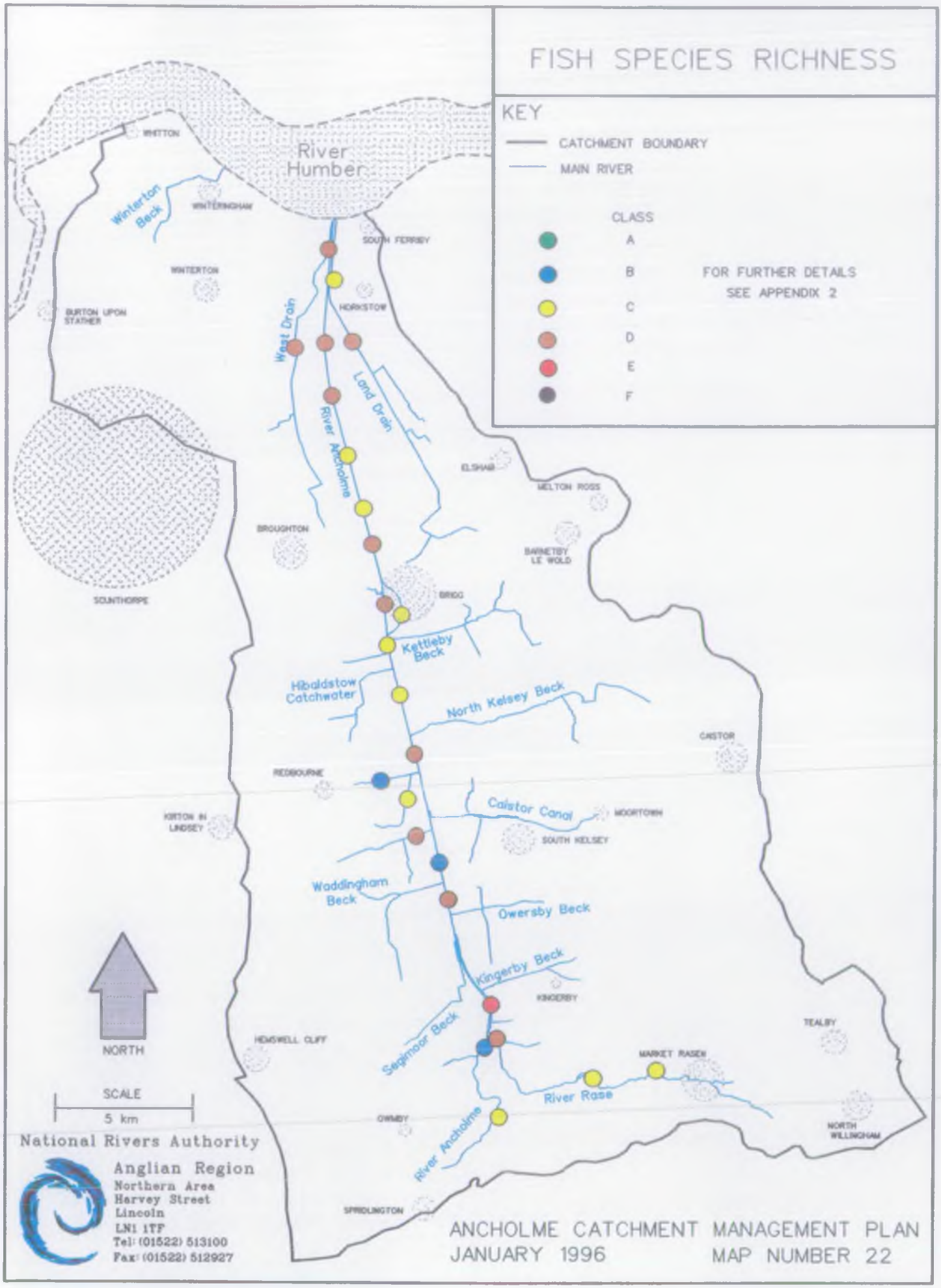
MAP NUMBER 21


FISH SPECIES RICHNESS
KEY
CATCHMENT BOUNDARY
MAIN RIVER
CLASS
A
B
C
D
E
F
FOR FURTHER DETAILS SEE APPENDIX 2
River Humber
WHITTON
WINTERTON
WINTERINGHAM
Winterton Beck
SOUTH FERRIBY
HORKSTOW
BURTON UPON STATHER
West Drain
Land Drain
River Ancholme
ELSHAM
MELTON ROSS
BROUGHTON
SAWNEBY LE WOLD
SCUNTHORPE
BRIGG
Kettleby Beck
Hibaldstow Catchwater
North Kelsey Beck
CAISTOR
REDBOURNE
KIRTON IN LINDSEY
Caistor Canal
MOORTOWN
SOUTH KELSEY
Waddingham Beck
Owersby Beck
Kingerby Beck
KINGERBY
TEALBY
HEMSWELL CLIFF
Segmoor Beck
MARKET RASEN
River Rase
OWMBY
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MAP NUMBER 22

4.5.3 Rowing

Other river users include the Ancholme Rowing club in Brigg who train and hold several competition events throughout the year. Another rowing club has the intention to use the lower reaches of the Ancholme around South Ferriby.

4.5.4 Canoeing

A canoe club has access to the river through the Brigg leisure centre, a concrete slipway to facilitate access for disabled canoeists has been constructed by the National Rivers Authority close to the leisure centre.

4.5.6 Walking

Quiet recreational use of the river and riparian land is carried out throughout all of the river length. The Glandford and Scunthorpe Countryside Project has sought to encourage this leisure pursuit and reinstate pathways and circular walks wherever possible. The river is fortunate in having numerous bridges along the entire main river section which provide good access along many banks.

The Town of Brigg enjoys close links to the river and public land adjoining the watercourse enjoys considerable use by both the local community

4.5.7 Swimming

During warm periods and school holidays reports have been received of children swimming in the river and jumping from structures into the river.

There are inherent dangers from weeds, underwater structures and undercurrents which can endanger even the strongest swimmers. There is also the risk of catching waterborne illnesses e.g. Weils disease.

Issues pertaining to recreation in this catchment which were dealt with in the Humber Estuary CMP Action Plan resolved to:

- produce Management Plans for NRA owned banks to improve and provide recreation facilities and access where appropriate.

4.6 CONSERVATION

The largest proportion of this catchment, the middle and lower sections, consists primarily of reclaimed fresh and salt water wetlands. Drainage works started as early as 1289, principally for navigation purposes. Serious attempts to drain the marshes and low fens followed in 1635 by Sir John Munson and have continued from this time to the present day, resulting in a productive, largely arable farming landscape. Previous wetland habitats in this zone are now only represented by marginal riverside aquatic vegetation or in flooded clay pits.

The western side of the catchment is formed by the western boundary of the Lincolnshire limestone ridge, along which the Roman road 'Ermine Street' runs from Lincoln to the Humber. Adjacent to Brigg, this area is well wooded and

includes Far Wood and Broughton Alder Wood, Sites of Special Scientific Interest (SSSI). In the latter, springs emerge feeding the West Drain. On the east of the Catchment, springs are similarly found along the edge of the chalk wolds such as at Elsham Marsh, Site of Nature Conservation Importance (SNCI). Close by, at Wrawby Moor (SSSI), wooded areas include zones of ancient wind-blown sand where areas of heathland occur. Comparable habitats also occur at the top of the catchment at Linwood Warren SSSI. In this south eastern corner of the catchment, the majority of the faster becks and streams are to be found. Such watercourses feed the River Rase which, untypical of the greater proportion of ponded 'main' watercourses in the catchment, contains areas of rapid flow, with riffle and pool systems. Some areas here have been impacted by impoundments and land drainage works. Water resources within these areas are at, or close to full commitment. Current and future demands for abstraction will need to be fully assessed for their impact on the water environment.

The Ancholme discharges into the River Humber which forms the northern boundary to the catchment. Although some of the saltmarshes and mudflats here have been reclaimed by the Humber Bank, extensive areas still remain. These are of international importance for wildfowl and wading birds. This status is recognised by its designation as a Ramsar site and Special Protection Area.

The Humber Estuary CMP Action Plan resolved to improve the conservation status of this catchment:

- To agree a site for a pilot scheme to recreate an area of inter-tidal habitat.
- To liaise with interested parties to exploit opportunities to increase inter-tidal areas.
- To carry out local initiatives to create and improve wetland habitats as opportunities arise.

River corridor surveys were carried out in 1991 and 1993 to establish the extent of plant and habitat diversity. These features are indicative of the overall health of the water environment. In general, river corridor plant diversity is low; of 359 sections, approximately 179.5km, only 1% (4 sections) could be described as diverse, containing 90 or more species(sp) per 500m length of river. Two sections on the River Rase gained their number principally as a result of urban open space on the edge of Market Rasen (99 sp) and Middle Rasen (92 sp). The remaining two sections on Sallow Row Drain (90 sp) and Old Winterton Beck (137 sp) both rely on buffer zones of riverside tree plantations and in the latter case herb-rich grass banks. The majority of the catchment (81%), falls between 51-89 species per section, 18% have 50 or less species per 500m section.

Within the river channel less than 1% (2 sections) could be regarded as diverse, having 20 or more aquatic plant species per 500m section. The majority of the catchment (62%), has a low diversity of 9 or less aquatic species per 500m length of river. Some sections however, do have wide margins of common reed, Phragmites australis; sweetgrass, Glyceria maxima; reed canary-grass, Phalaris arundinacea, and greater pond sedge Carex riparia which are important as shelter, food and nesting sites for specialised birds and invertebrates. Currently the extent and value of these habitats in monitoring conservation status rely on a subjective analysis of presence or absence. Their full status awaits a more objective methodology and mapping technique.

Along the Humber Bank (22 sections), approximately 11km, (45%) contained between 51-89 species per section, 55% had 49 species or less per 500m section.

In common with many lowland catchments the diversity of plant species has been dramatically reduced by current land-use practices, primarily intensive arable farming and land drainage. High river corridor plant diversity correlates with unmanaged, or sensitively managed, 'buffer zones' adjacent to watercourses.

RIVER CHANNEL AQUATIC PLANT SPECIES DIVERSITY AND PLANT DIVERSITY ALONG RIVER CORRIDORS AND TIDAL DEFENCES ARE SHOWN ON MAP NOS 23 AND 24

4.6.1 Macroinvertibrates

The Upper R. Rase represents one of the few sections of relatively natural habitat in the Ancholme catchment. As such, it supports a rich chalkstream fauna, including a number of nationally and locally rare species associated with base rich riffle head waters:

Amphinemura standfussi (a nationally scarce species of stonefly)
Riolus subviolaceus (a nationally notable (Nb) riffle beetle)
Rhyacophila septentrionis (a nationally notable caseless caddisfly)
Wormaldia sp. (a regionally very rare caseless caddisfly, nationally restricted in distribution)
Sialis fuliginosa (a highly habitat-specific alderfly, associated with the upper reaches of rivers, and regionally scarce).

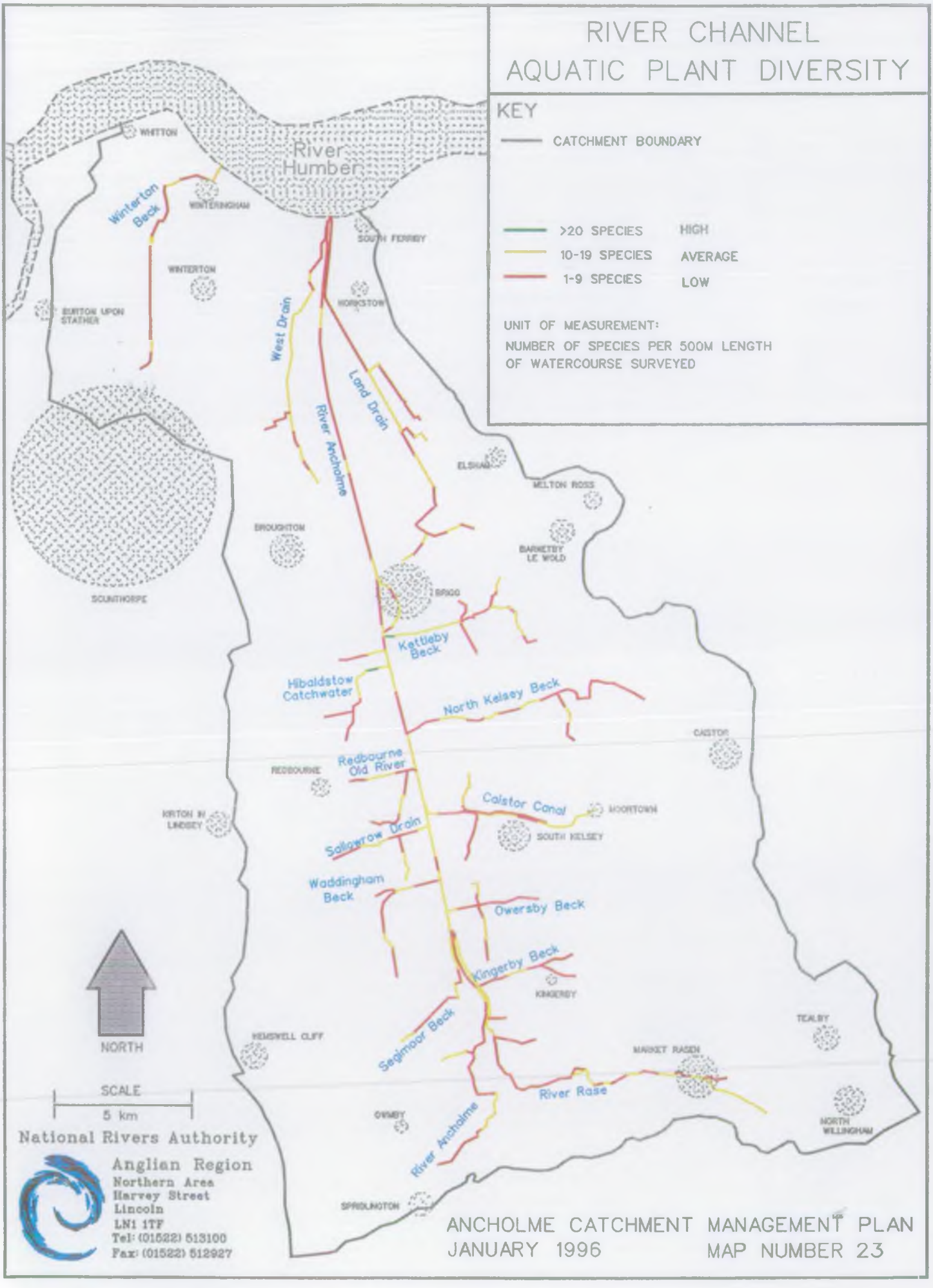
All of the above species inhabit a very narrow range of habitats in the UK, and are therefore highly sensitive to disturbance. E.g. Wormaldia already seems to have disappeared from the Upper Rase, following siltation caused by impoundment of sections of the channel for trout ponds. Last recorded in 1987, this species is still present in the neighbouring catchment area.

Some of these species occur elsewhere in the catchment, also in relatively undisturbed, base-rich streams (e.g. S. fuliginosa (Kettleby Beck) and A. standfussi (Scawby Brook, upper N. Kelsey Beck)).

The North Kelsey Beck/Caistor Canal system is also notable for regionally rare species of bug (Sigara concinna and S. venusta). The latter is also found in the upper reaches of the main R. Ancholme.

Another regionally rare bug, Sigara semistriata, occurs in a tributary of the Winterton Beck, near West Halton.

Very little, if any, of the fen drain system surrounding the Ancholme is undisturbed. A single relict species, the nationally notable (Nb) beetle, Hygrotus quinquelineatus, occurs in the East Weir Dyke. Reinstatement or enhancement of relict fen habitats may increase the range of this, and other relict species, in the Ancholme catchment.


RIVER CHANNEL
AQUATIC PLANT DIVERSITY
KEY
CATCHMENT BOUNDARY
>20 SPECIES HIGH
10-19 SPECIES AVERAGE
1-9 SPECIES LOW
UNIT OF MEASUREMENT:
NUMBER OF SPECIES PER 500M LENGTH OF WATERCOURSE SURVEYED
River Humber
WHITTON
WINTERINGHAM
Winterton Beck
WINTERTON
BURTON UPON STATHER
SOUTH FERRIBY
HORKSTOW
West Drain
River Ancholme
Land Drain
ELSHAM
MELTON ROSS
BARNETBY LE WOLD
BROUGHTON
SCUNTHORPE
BRIGG
Kettleby Beck
Hibaldstow Catchwater
North Kelsey Beck
CAISTOR
REDBOURNE
Redbourne Old River
Caistor Canal
MOORTOWN
SOUTH KELSEY
KIRTON IN LINDSEY
Sallygrow Drain
Waddingham Beck
Owersby Beck
Kingerby Beck
KINGERBY
HEMSWELL CLIFF
Segimoor Beck
TEALBY
MARKET RASEN
River Rase
NORTH WILLINGHAM
OWMBY
River Ancholme
SPRIDLINGTON
NORTH
SCALE
5 km
National Rivers Authority
Anglian Region
Northern Area
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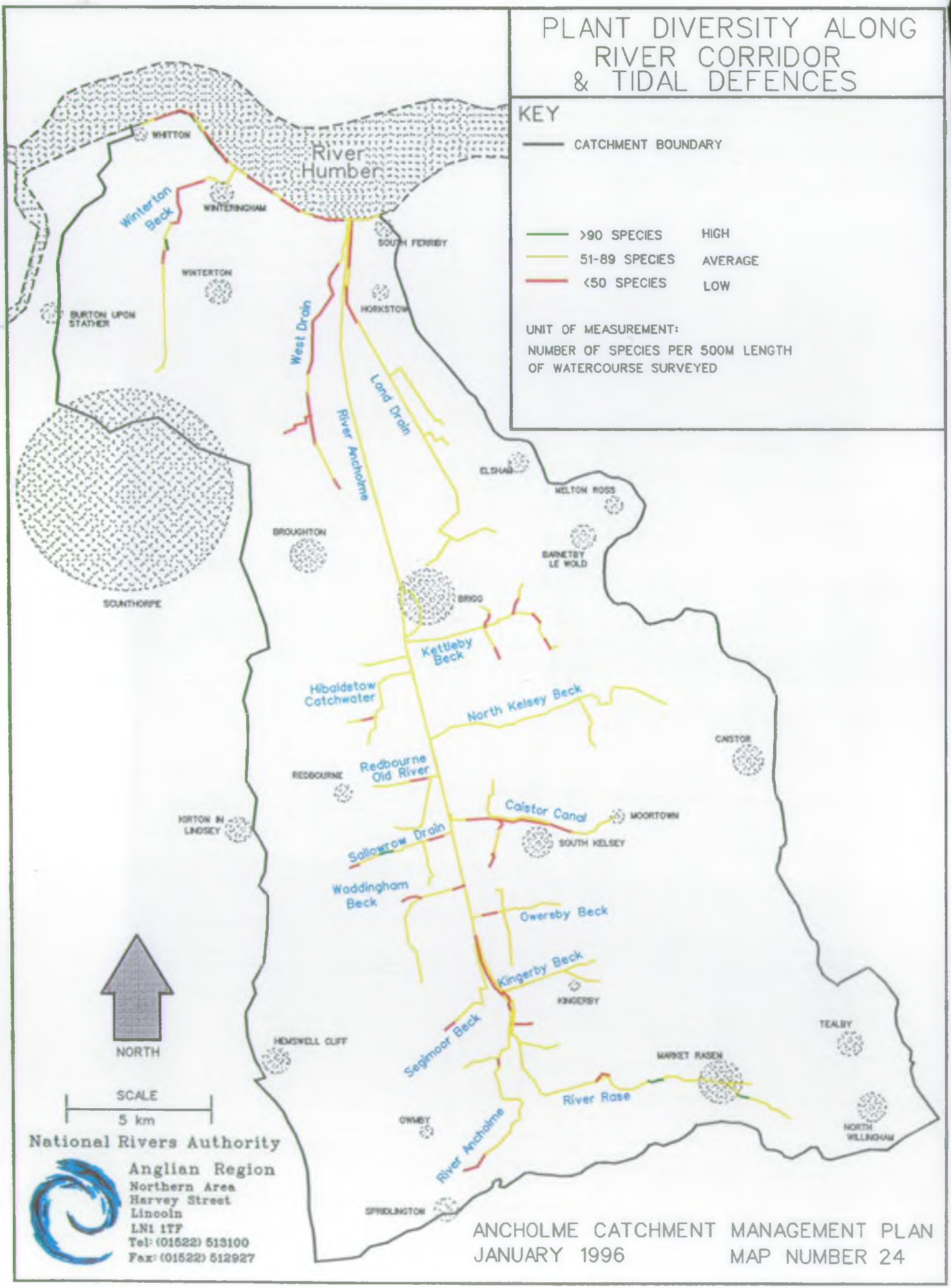
ANCHOLME CATCHMENT MANAGEMENT PLAN
JANUARY 1996
MAP NUMBER 23

PLANT DIVERSITY ALONG RIVER CORRIDOR & TIDAL DEFENCES



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ANCHOLME CATCHMENT MANAGEMENT PLAN
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Another species of note is the nationally notable (Na) riffle beetle, Oulimnius rivularis, which has been found at the lower end of the main R. Ancholme, near Horkstow Bridge.

MACROINVERTIBRATES OF CONSERVATION VALUE ARE SHOWN ON MAP NO. 25

4.7 NAVIGATION

The Ancholme Navigation is 31 kilometres long. However, the lock at Harlam Hill is not, as yet, fully restored and consequently the top 4 kilometres (Harlam Hill - Bishops Bridge) is separate from the main navigable length.

4.7.1 South Ferriby Lock

South Ferriby Lock is owned, maintained and operated by the National Rivers Authority. The lock has 4 pairs of timber gates and the original gates were thought to have been constructed out of English Oak, but the present gates, which date from 1904, are constructed from a variety of timbers. The 1904 gates last underwent major refurbishment in 1944, and currently are in need of refurbishment.

The hydraulic lift road bridge is electrically operated and is part of the locking operation controlled by the lock keepers. The locking procedure is slow and arduous and requires 2 lock keepers to be present. The lock keepers hand operate pinions and screws to raise/lower cast iron paddles to allow water in/out of the lock. The doors are opened and closed by manually operated counter balance beams assisted by winches and wires.

Vessels can enter the lock from the Humber and the Ancholme during all conditions except around low tidal states or when the River Ancholme is in flood. During low water, river water is used to fill the lock and it is drained into the Humber as the vessel moves out of the river. During high water, Humber water is used to fill the lock and the brackish water is subsequently drained into the West Drain via culverts. However, whenever a boat enters the Ancholme from the Humber during high water, some of the brackish water remaining in the lock will mix with river water when the inner doors are opened. Consequently boat locking contributes to saline intrusion in the lower River Ancholme, Figure 5 illustrates this problem.

In 1994 the NRA undertook a questionnaire survey of all registered users in the Anglian Region which indicated that users felt that the provision of facilities and services on the navigation were inadequate. Users were keen to see additional weed cutting/removal, more landing stages and increased river depth by dredging. Over half of the boat users on the Ancholme had experienced a delay at South Ferriby Lock and, on average, this delay was estimated to be about 40 minutes. Eleven per cent said that they had been delayed 'very often' at the lock.

Sea-going vessels are the main craft on the Ancholme Navigation, representing 55% of the numbers licensed. Most of their cruising will be through the lock and out to the Humber. River cruisers make up 29% of the total with the remaining 16% including canoes, rowing boats and others. The major attraction for boaters using the Ancholme is that it is 'local' and an easy system to use.

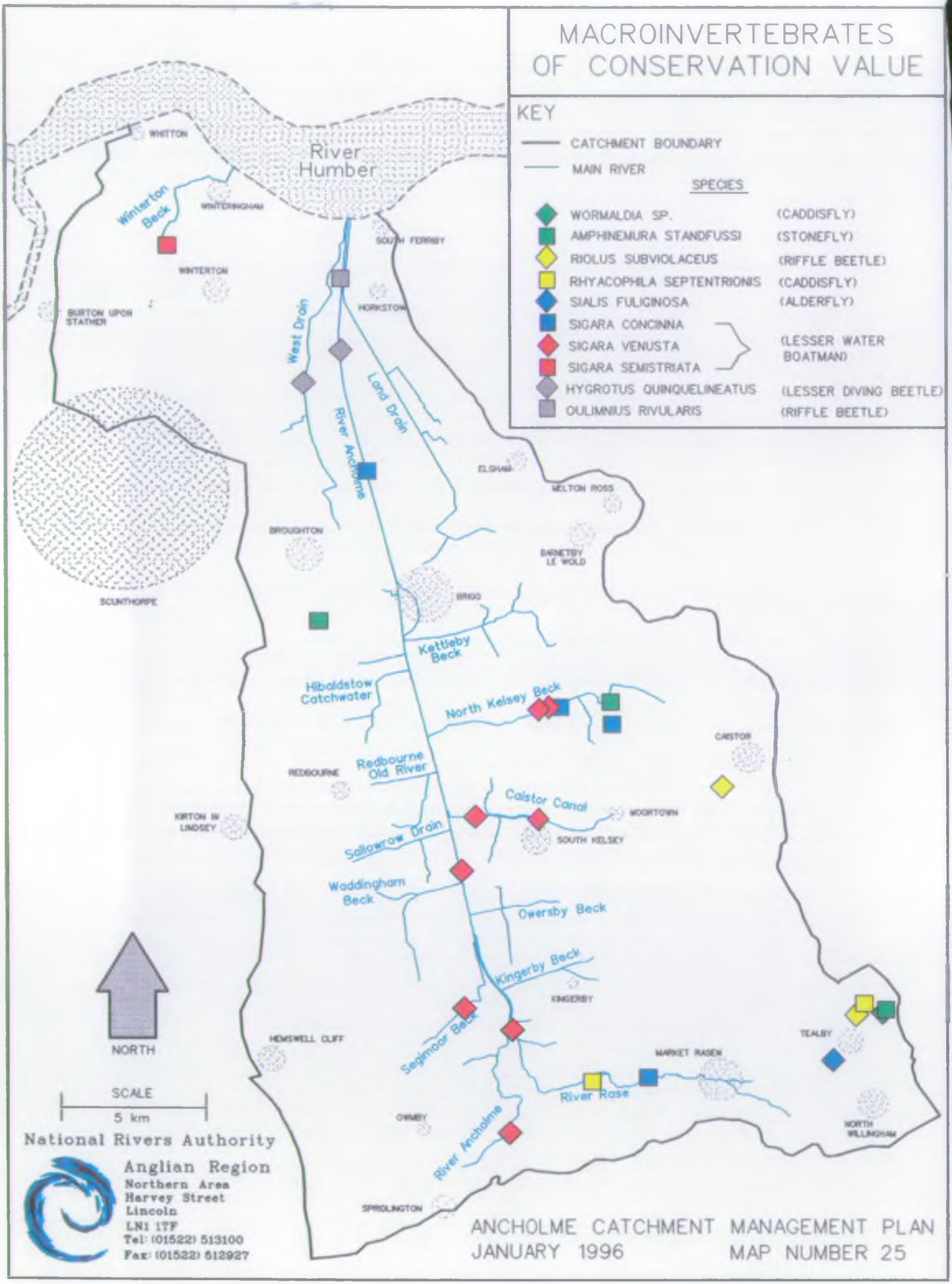
MACROINVERTEBRATES
OF CONSERVATION VALUE
KEY
CATCHMENT BOUNDARY
MAIN RIVER
SPECIES
WORMALDIA SP. (CADDISFLY)
AMPHINEMURA STANDFUSSI (STONEFLY)
RIOLUS SUBVIOLACEUS (RIFFLE BEETLE)
RHYACOPHILA SEPTENTRIONIS (CADDISFLY)
SIALIS FULIGINOSA (ALDERFLY)
SIGARA CONCINNA
SIGARA VENUSTA
SIGARA SEMISTRIATA
(LESSER WATER BOATMAN)
HYGROTUS QUINQUELINEATUS (LESSER DIVING BEETLE)
OULIMNIUS RIVULARIS (RIFFLE BEETLE)
River Humber
WHITTON
Winterton Beck
WINTERINGHAM
WINTERTON
BURTON UPON STATHER
SOUTH FERRIBY
HORKSTOW
West Drain
Land Drain
River Ancholme
ELSHAM
MELTON ROSS
BROUGHTON
BARNETBY LE WOLD
SCUNTHORPE
BRIGG
Kettleby Beck
Hibaldstow Catchwater
North Kelsey Beck
CAISTOR
REDBOURNE
Redbourne Old River
Caistor Canal
WOOLTOWN
KIRTON IN LINDSEY
Sallowrow Drain
SOUTH KELSEY
Waddingham Beck
Owersby Beck
Kingerby Beck
KINGERBY
HEMSWELL CLIFF
Segsmoor Beck
TEALBY
MARKET RASEN
River Rase
OWMBY
River Ancholme
NORTH WILLINGHAM
SPRIDLINGTON
NORTH
SCALE
5 km
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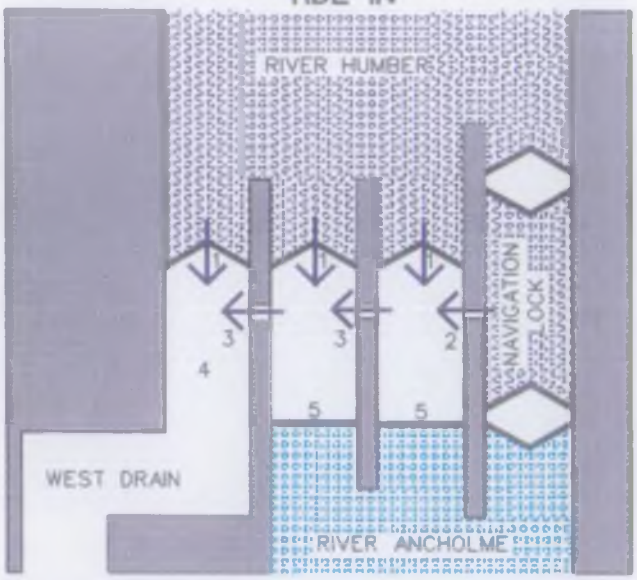
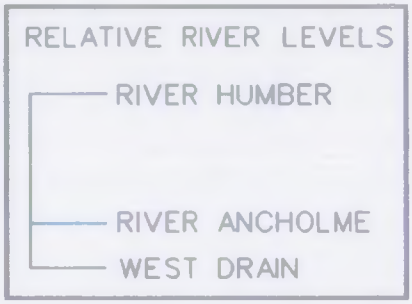
DIAGRAM OF SOUTH FERRIBY LOCK AND SLUICE

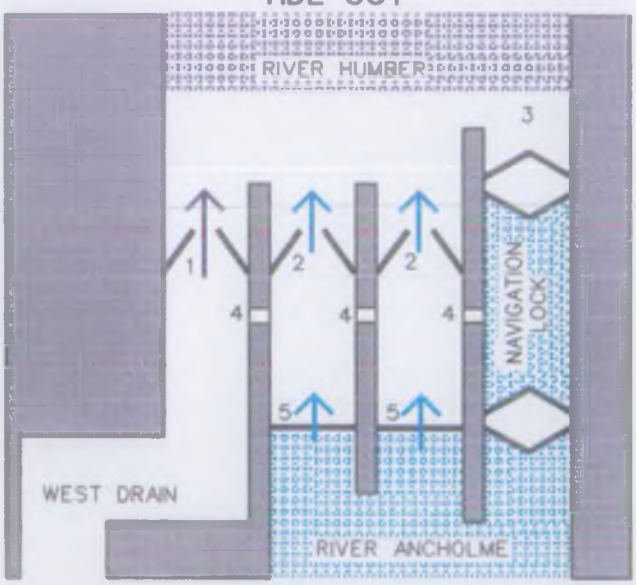
TIDE IN

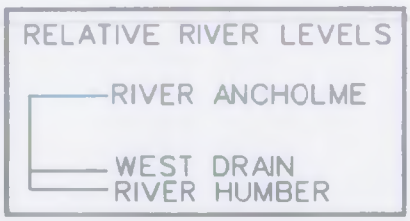




1 LEAKAGE OF SALINE WATER OCCURS THROUGH THE SHUT TIDAL DOORS
2 DISCHARGE OF SALINE WATER VIA PENSTOCK FROM LOCK OPERATIONS
3 SALINE WATER PASSES INTO THE WEST DRAIN VIA PENSTOCKS FOR TEMPORARY STORAGE
4 SALINE WATER IS STORED IN THE WEST DRAIN UNTILL LOW TIDE
5 VERTICAL GUILOTINE GATES RETAIN FRESH WATER IN THE RIVER ANCHOLME

TIDE OUT





1 UNCONTROLLED DISCHARGE OF SALINE WATER VIA OPEN TIDAL DOORS PREVEOUSLY STORED IN THE WEST DRAIN
2 FRESH WATER FROM THE RIVER ANCHOLME IS DISCHARGED VIA THE OPEN TIDAL DOORS
3 FRESH WATER USED IN LOCK OPERATIONS IS DISCHARGED TO THE RIVER HUMBER
4 PENSTOCKS SHUT
5 THE RIVER ANCHOLME LEVEL CAN BE CONTROLLED BY PASSING WATER UNDER THE GUILOTINE GATES

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ANCHOLME CATCHMENT MANAGEMENT PLAN
JANUARY 1996 FIG NUMBER 5

4.7.2 Moorings and Facilities

The NRA owns a 12 foot wide strip of land on both sides of the new River Ancholme except where buildings abutt the river. Moorings are leased by the NRA at locations down the river.

The 3 key locations on the river with respect to navigation moorings and facilities are at South Ferriby, Brigg and Brandy Wharf:

South Ferriby

The NRA, with contributions from Glanford Borough Council and Glanford Countryside Project, have constructed a sanitary station just upstream of South Ferriby Lock and a car park at Holmes Yard. The sanitary station consists of a pump out, chemical toilet disposal point and water point. The NRA also own and manage 50 moorings at South Ferriby, which combined with the 66 moorings associated with Clapson's Marina means that this area can cater for a significant number of boats.

Brigg

Glanford Boat Club have 100 moorings at Brigg around Brigg Island at Coaldyke End. Car parking is available in the town and a canoe launch site suitable for disabled people was constructed near the leisure centre by the NRA.

There is also a recently constructed marina in Brigg which offers around 25 private moorings.

The channel depth of the Old River Ancholme at Brigg is shallow and can restrict navigation.

Brandy Wharf

Some moorings are available adjacent to the Cider Centre at Brandy Wharf, which also provides a telephone and obviously a public house.

4.8 LAND USE/DEVELOPMENT

Changes in land use and development have perhaps the most influence upon the water environment. The NRA is well placed to influence certain factors affecting the water environment through its own regulatory controls, particularly along Main river corridor, but it has no direct control over the mechanisms which determine land use change. These are largely controlled by Local Planning Authorities (LPA's).When development proposals contain potentially adverse implications for the water environment the NRA seeks mitigation and enhancement wherever possible to counter these impacts.

The NRA's plans for the future management of the water environment (CMP's) need to be integrated with LPA's strategic plans. Any development upon which the

NRA is consulted, whether through the formal planning process or otherwise, provides an opportunity for the NRA to consider the broader environmental effects.

These will be in line with the principles of sustainable development to safeguard the water environment.

Through the planning system, the NRA will seek to prevent damage to environmental assets likely to be important to current and future generations and identify opportunities to remedy past damage.

The catchment is situated within the administrative boundaries of Lincolnshire and Humberside County Councils, Scunthorpe Borough Council and the District Councils of West Lindsey and Glanford.

Each of the LPAs within the catchment have produced Local Plans on which the NRA have been consulted. The Lincolnshire Structure Plan currently being produced will succeed the existing Plan and cover the period to the year 2011. Local Plans currently being produced will cover the period to the year 2001. Subsequent Local Plans will be produced by District Councils to cover the period to the year 2011. The current state of those plans is shown in Table 5.

TABLE 4 - STRUCTURE AND LOCAL PLANS

PLANNING AUTHORITY	DEVELOPMENT PLAN TITLE	STATUS
LINCOLNSHIRE COUNTY COUNCIL	Lincolnshire Structure Plan	Consultation Draft due 1996
WEST LINDSEY DISTRICT COUNCIL	West Lindsey Local Plan	Consultation Deposit 1994.
GLANFORD DISTRICT COUNCIL	Glanford District Local Plan	Consultation Draft Sept 1994
HUMBERSIDE COUNTY COUNCIL	Humberside Structure Plan	Consultation Draft Jan 1994
SCUNTHORPE BOROUGH COUNCIL	Scunthorpe District Local Plan	Deposit draft due Sept 1994.

The extent of future population growth is indicated in the table below using an NRA database of population predictions for villages of greater than 2000 inhabitants.

PREDICTED CHANGE IN POPULATION FIGURES

TABLE 5

LOCATION	POP '93	POP '2001	% GROWTH
BRIGG	5862	6374	8.7
MARKET RASEN	3496	4339	24.1
CAISTOR	2931	3600	22.8
WINTERTON	5249	5481	4.4
BROUGHTON	5030	5269	4.8
SCAWBY	2589	2752	6.3
TOTAL	25157	27815	10.6

Re-development sites for industrial purposes exist at Scunthorpe, Brigg and at disused airfields.

Key development features of the catchment are:

- Development in areas at risk of flooding along the River Rase;
- Unauthorised development along the banks of watercourses;
- Industrial development at Scunthorpe, together with smaller industrial estates at the larger villages;
- Development in areas where there are inadequate foul drainage systems;
- Existing and proposed mineral extraction along the western boundary of the catchment;
- Development for recreational and navigation use along the Ancholme.
- The NRA is particularly sensitive to development which might impact upon ground and surface water and therefore seeks the support of the PA's for its Policy and Practice for the Protection of Groundwater.

To ensure the water environment is adequately protected will require close co-operation between the NRA, Planners, and Developers. In particular, the development of a strategic approach to infrastructure planning and development, together with the adoption of NRA Policies and Guidance Notes would assist substantially in ensuring appropriate development and protection of the water environment.

To enable the LPAs to fulfil their obligation with regard to the concept of sustainability, and in order to meet the NRA's duty to protect the water environment, the NRA has produced and distributed to all Planning Authorities its "Guidance Notes for Local Planning Authorities on the Methods of Protecting the Water Environment through Development Plans".

The assimilation of these policies into Development Plans has been achieved with a variable degree of success, limited in part by the timing and ongoing Development Plan process by individual LPAs. The NRA acknowledges the need for improvement in liaison with LPAs and is currently reallocating its administrative resources accordingly.

The NRA recognises the adverse implications of "piecemeal development" and supports a more structured approach to development by Planning Authorities. The cumulative effect of piecemeal development can result in risks to ground and surface water quality, flood defence and conservation interests. The implementation of strategic planning and holistic infrastructure development could reduce overall infrastructure costs and ensure protection of the water environment.

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5. CATCHMENT TARGETS

5.1 INTRODUCTION

This section identifies the NRA's principal aims and broad strategies in relation to it's main responsibilities of water resources and water quality management, flood defence, fisheries, recreation, conservation and navigation. These aims will be actively pursued by the NRA, they will necessitate the balancing of costs against benefits within the integrated system of catchment management, taking the needs of all users and NRA interests into account.

5.2 WATER RESOURCES

5.2.1 Principal Aim

The NRA's principal aim in relation to water resources is to:

- manage water resources to achieve the right balance between the needs of the environment and those of the abstractors.

To achieve this aim, the NRA seeks to:

- plan for the sustainable development of water resources, developing criteria to assess reasonable needs of abstractors and of the environment;
- collect, validate, store and provide hydrometric data and environmental data in order to assess water resources;
- apply a consistent approach to abstraction licensing;
- implement a consistent approach to the resolution of inherited problems caused by authorised over-abstraction;
- work with other organisations to protect the quality of our water resources.

5.2.2 Specific Targets

In implementing this strategy in the Ancholme Catchment a number of criteria are relevant:

- to protect the aquifers and surface waters from over-commitment and ensure that abstraction does not have an unacceptable effect on existing abstractors or on environmental waters;
- to protect water related conservation sites and environmental flows from over-commitment of resources and set minimum flows and minimum levels wherever necessary and ensure their compliance;
- to augment and/or redistribute water resources, where appropriate, to meet existing catchment water demands to the following standards of reliability:

Public Water Supply:-

- a hosepipe ban not more than once in every 10 years on average;
- voluntary restrictions required not more than once in every 20 years on average;
- rota cuts or standpipe required not more than once in every 100 years on average;
- spray irrigation shortages not more than once in every 12 years on average.

- to apply the principle of sustainability of water resources and where the impact of abstraction is uncertain, take a precautionary approach;
- to encourage efficient water uses, re-use of water where appropriate and effective leakage control;
- to encourage the development of winter storage reservoirs to meet irrigation demand where appropriate;
- to identify environmental water needs and balance the needs of abstraction with those of the environment.

5.3 WATER QUALITY

5.3.1 Principal Aims

The NRA's principal aims in relation to water quality are to:

- achieve a continuing overall improvement in the quality of rivers and groundwaters through the control of pollution;
- ensure that dischargers pay the costs of the consequences of the discharges.
- To achieve these aims the NRA seeks to:
  - maintain waters that are already of high quality;
  - improve waters of poorer quality;
  - ensure all waters are of an appropriate quality for their agreed uses;
  - provide advice to individuals and developers on measures to be taken to reduce the risk of pollution at their sites;

- prosecute polluters and recover the costs of restoration;
- devise charging schemes that allocate the costs of maintaining and improving water quality fairly and provide incentive to reduce pollution.

5.3.2 Specific Targets

In implementing its aims in the Ancholme Catchment a number of specific targets are relevant:

- to ensure that water quality is maintained and where necessary improved to meet EC Directives, and specific Water Quality Objectives in the catchment rivers;
- to ensure that discharge consents adequately safeguard surface and groundwater quality and prevent exceedence of EC Directives and Water Quality Objectives;
- to ensure, through an effective system of monitoring (by NRA and/or others) compliance with EC Directives on substances discharged to groundwaters;
- to ensure landfill activity does not compromise water quality or water resources and that the restoration of all sites is to an acceptable environmental standard;
- to implement and enforce groundwater protection zones and the NRA's Groundwater Protection Policy to protect aquifers and water sources from contamination, and the effects of development including mineral extraction;
- to ensure that point source pollution of ground and surface waters is prevented and/or controlled wherever possible;
- to prevent/control diffuse pollution so as to protect ground and surface water;
- to implement effective pollution alleviation and provide pollution prevention advice to reduce the incidence and impact of pollution;
- to maintain strong links with government regulators and developers to ensure potentially polluting activities are controlled wherever possible;
- seek to prevent pollution from the redevelopment of contaminated land;
- to maintain strong links with MAFF on the implementation of Nitrate Sensitive Areas and Nitrate Vulnerable Zones;
- to develop a policy for the identification of groundwater protection zones.

5.4 FLOOD DEFENCE

5.4.1 Principal Aims

The NRA's principal aims in relation to flood defence are to:

- reduce the risks to people and the developed and natural environment against flooding from rivers and from the sea;
- provide adequate arrangements for flood forecasting and warning.

To achieve these aims the NRA seeks to:

- maintain fluvial and tidal defences and structures to appropriate standards;
- develop and implement the flood defences strategy through a systematic approach for assessing capital and maintenance requirements and develop medium and long-term plans for those defences owned and maintained by the NRA;
- encourage development of information technology and extension of facilities which will further improve the procedure for warning of, and responding to, emergencies;
- support Research & Development which will assist in identifying future flood defence needs;
- review best practices for all operational methods and the identification and justification of work, thus increasing efficiency and enhancing value for money;
- heighten general awareness of both Planning Authorities and developers of the need to control development in flood plains;
- identify opportunities for the enhancement of environmental, recreational and amenity facilities when undertaking flood defence works.

5.4.2 Target Standards of Defence

Notional target standards of protection from tidal and fluvial defences are provided by NRA standards of service targets and MAFF guidance notes of indicative standards of protection for different types of land use. These notes also give guidance on economic justification.

The 5 bands of land use are shown in Table 6.

TABLE 6 - FLOOD DEFENCE - STANDARDS OF SERVICE		
LAND USE BAND	TARGET STANDARD OF PROTECTION (RETURN PERIOD)	
	FLUVIAL	TIDAL
High density urban containing significant amount of both residential and non-residential property	1:50 - 1:100	1:100 - 1:200
Medium density urban. Lower density than above, may also include some agricultural land.	1:25 - 1:100	1:50 - 1:200
Low density or rural communities with limited number of properties at risk. Highly productive agricultural land.	1:5 - 1:50	1:10 - 1:100
General arable farming with isolated properties. Medium productivity agricultural land.	1:1.25 - 1:10	1:2.5 - 1:20
Predominantly extensive grass with very few properties at risk. Low productivity agricultural land.	<1:2.5	<1:5

It should be noted that these standards are indicative only and do not represent an entitlement to protection. They are a starting point on which the NRA assesses the economics of providing defences, depending on the land use it will protect.

Once it is decided a flood defence improvement scheme is required for a given location, a range of options will be considered by the NRA. Each of these options has to be evaluated. The capital, maintenance and environmental costs of any works to the defences must be contrasted with the benefits of providing the level of protection. Options may also be considered for different levels of protection. Usually the most economic and environmentally acceptable option which yields the desired level of protection would be chosen, although a lesser level of defence may be accepted if the indicative standard cannot be justified when comparing costs against benefits. The consequence of this is that a level of protection ultimately chosen ie. the design standard, may not always be consistent with the indicative standard.

5.4.3 Specific Targets

In implementing its principal aims in the Ancholme Catchment a number of specific targets are relevant:

- to maintain and improve the standards of tidal defence to accommodate future changes in sea level rise;

- to operate and maintain river systems and associated structures to achieve effective and efficient land drainage;
- to operate an effective flood warning service and pass warning messages to the police;
- to seek to ensure that new development does not increase flood risk in the catchment;
- ensure opportunities for conservation, recreation and enhancement of the environment are identified and implemented where justified.

5.5 FISHERIES

5.5.1 Principal Aim

The NRA's principal aim in relation to fisheries is to:

- maintain, improve and develop fisheries.

To achieve this aim the NRA seeks to:

- protect and conserve trout, freshwater, eel and, where appropriate, coastal fisheries;
- regulate fisheries through the enforcement of a consistent service of licences, orders, byelaws and consents;
- monitor the fisheries status of rivers and inland waters, estuaries and where appropriate, coastal waters;
- formulate policies to maintain, improve and develop fisheries and restore and rehabilitate damaged fisheries;
- provide an efficient and effective fisheries service which is responsive to the needs of its customers and which is based on a sound charging system.

5.5.2 Specific Targets

In implementing the broad strategy in the Ancholme Catchment a number of specific targets are relevant:

- to sustain a natural fish population appropriate to the catchment and achieve Class A in terms of both biomass and species richness;
- to maintain regular monitoring and re-appraisal of the fisheries resource;
- to ensure that fisheries are not adversely affected by water resources, flood defence and other developments and ensure active involvement in determining the requirements of Environmental Impact Assessments and the auditing of Environmental Statements;

- to ensure there is a variety of habitat, including pool/riffle sequences and reedbeds for feeding, spawning etc. and to ensure the presence of bankside vegetation to provide adequate shade and cover;

- to maintain where practicable, a variable flow regime where the monthly average reflects the natural flow conditions in the river and flows do not decline below the historic monthly 95 percentile flows, except during extreme drought conditions;

- to respond efficiently to emergency incidents involving issues to fish, seeking to prevent or limit fish losses;

- to minimise the deleterious impact of river maintenance operations on habitat diversity;

- to maintain the bubble curtain and protection measures used to reduce the impact of saline incursion in the Ancholme.

5.6 RECREATION

5.6.1 Principal Aim

The NRA's principal aim in relation to recreation is to:

- develop the amenity and recreational potential of inland and coastal waters and associated lands.

To achieve this aim the NRA seeks to:

- maintain, develop and improve recreational use of NRA sites;

- take account of recreation in proposals relating to any NRA functions;

- promote the use of water and associated land for recreation purposes.

5.6.2 Specific Targets

In implementing the broad strategy in the Ancholme Catchment a number of specific targets are relevant:

- to maintain and improve water quality in order that the amenity value of the watercourses may be enhanced and protected;

- to maximise public access to land in NRA ownership (subject to consideration of constraints), places of natural beauty and to buildings, sites of archaeological, architectural and historic interest;

- to promote the use of river corridors as a recreational facility without compromising other uses;

- to safeguard existing recreational uses and, where practicable, incorporate recreational facilities into schemes being designed for their reasons;

- to encourage the development of footpath access along NRA owned river bank.

In pursuance of these aims the NRA seeks to:

- take into account the needs of persons who are sick or disabled;

- maintain and enhance the diversity of natural river features and other riverine habitats;

- maintain and enhance the diversity of aquatic vegetation and of the river corridor in general;

- take account of recreational use when setting water quality objectives, and minimum flows/levels and when determining planning applications and applications for effluent discharge or abstraction;

- provide suitable and safe access for angling and encourage the development of new fisheries;

- protect and enhance fish status.

5.7 CONSERVATION

5.7.1 Principal Aim

The NRA's principal aim in relation to conservation is:

- to conserve and enhance wildlife, landscape and archaeological features associated with inland and coastal waters.

To achieve this aim the NRA seeks to:

- assess and monitor the conservation interest of inland and coastal waters and associated lands;

- ensure that the NRA's regulatory, operational and advisory activities take full account of the need to sustain and further conservation;

- promote conservation to enhance the quality of the aquatic and related environment for the benefit of wildlife and people.

5.7.2 Specific Targets

In implementing the broad strategy in the Ancholme Catchment a number of specific targets are relevant:

- to monitor habitats and associated flora and fauna of inland waters and associated lands, together with landscape and archaeological features;

- to assess the conservation interests of inland and coastal waters, and their potential, and work closely with others to target resources to protect the sites of the highest conservation interest and, wherever possible, rehabilitate degraded rivers and wetlands;

- to evaluate the impacts of applications for abstraction licences and discharge, land drainage and fisheries consents and ensure that conservation and archaeological interests are protected;

- to minimise the impact of the NRA's operational and regulatory activities and implement enhancement measures wherever possible;

- to maintain a variable flow regime in an appropriate channel cross section where the monthly average flow reflects the natural flow conditions in the river and flows do not decline below the historic monthly 95 percentile flows, except during extreme drought conditions;

- to maintain ground and surface water quality and level so that sensitive wetland ecosystems are protected;

- to maintain and enhance the diversity of aquatic vegetation, natural river features and other riverine habitats and the river corridor in general;

- to require internal and external development proposals to be subject to environmental Assessment;

- to work with planners and developers to ensure that conservation interests are taken fully into account.

5.8 NAVIGATION

5.8.1 Principal Aim

The NRA's principal aim in relation to navigation is to:

- improve and maintain inland waters and their facilities for use by the public where the NRA is the navigation authority.

To achieve this aim the NRA seeks to:

- contribute to the development of an overall navigation strategy for England and Wales;

- regulate NRA navigations through the enforcement of a consistent series of licences, orders, byelaws and statutes;

- maintain and improve the NRA navigation fairway, facilities and standards;

- recover from users the costs of providing specific navigation facilities and a reasonable proportion of the costs of maintaining the navigation.

5.8.2 Specific Targets

In implementing the broad strategy in the Ancholme Catchment a number of specific targets are relevant.

- to maintain and operate the South Ferriby Lock thereby maintaining the Ancholme as a 'safe haven' for boats in the Humber Estuary;
- to maintain existing navigation facilities and services on the Ancholme;
- to improve existing navigation facilities and services on the Ancholme in line with the Regional Navigation Strategy (Draft) and identified customer requirements;
- to continue to operate South Ferriby Lock to permit boats access between the Humber and the Ancholme;
- to restore Harlam Hill Lock to permit boats to travel the full length of the Navigation.

6. ISSUES AND OPTIONS

The catchment planning process seeks to identify all the water environment related problems in this catchment and their possible solutions.

This section presents the issues and options identified by the NRA in previously undertaken consultation with other interested parties - including planning authorities, conservation groups, farming and industrial representatives. They are presented to you in anticipation that you would like to express an opinion on the issues and options identified; that you may be aware of issues that our pre-consultation has not brought to light or of options to solve issues which should be considered.

The issues and options are deliberately not presented in any order of priority and are not costed out, the options should not be regarded as mutually exclusive. In further management of these problems the NRA and others identified in their solution will undertake cost benefit analysis of all practicable solutions. The practicality of resourcing and solving some issues means that a number of issues identified will take a considerable length of time to resolve.

The ultimate success of catchment planning depends on a healthy partnership between the NRA, industry, other Government agencies and the public being developed.

ISSUE 1

FLOOD PROTECTION AT CERTAIN LOCATIONS IN THE CATCHMENT ARE BELOW TARGET STANDARDS.

BACKGROUND

River Rase

High flows in the River Rase caused flooding of properties in 1981 and 1993. Investigations have identified that events greater than a 1 in 20 year return period will cause flooding in the future. A feasibility study is in progress to identify and consider options.

River Ancholme and Tributaries

Bank instability, due to seepage at times of high river levels and as a consequence of erosion which is undermining the toe of the river banks, together with changes in river flows and levels as a result of more efficient field drains are affecting the Ancholme and its tributaries. Lengths affected include Brandy Wharf and Snitterby, Redbourne, Hibaldstow and Broughton Carrs.

Ancholme Valley flood defence improvements are now in the capital programme for 1996 to 1998 - a feasibility study was commenced in 1995.

OPTIONS	RESPONSIBILITY	ADVANTAGES	DISADVANTAGES
NRA to investigate the feasibility of measures to improve flood protection. This will consider options such as :			
Raising bank levels.	NRA/Ministry of Agriculture Fisheries and Food(MAFF).	Reduced risk of flooding. Provide a consistent standard of defence.	Cost. Environmental Impact.
Constructing flood storage reservoirs to attenuate high flows.	NRA/MAFF	Reduced risk of flooding. Provide a consistent standard of defence. Possible environmental benefits.	Cost.
Provision of anti-seepage works.	NRA/MAFF	Reduced risk of flooding due to breaches.	Cost
Restoration/protection of towpaths/berms.	NRA/MAFF	Reduced risk of flooding. Provide a consistent standard of defence. Improved public access.	Cost
Accept existing standard of defence.	NRA/MAFF		Increased risk of flooding.

ISSUE 2

SEVEN "ACCOMMODATION" BRIDGES CROSSING THE RIVER ANCHOLME HAVE AN INADEQUATE LOAD BEARING CAPACITY

BACKGROUND

The NRA is responsible for seven bridges crossing the River Ancholme by virtue of The Ancholme Act 1767. All were built between 1840 and 1890, and have timber decks. Six of the bridges are listed Grade 2 structures. In addition to having footpaths or bridleways crossing them adjacent landowners have rights of access over the bridges for farm vehicles. Analysis of their load bearing capacity by modern codes of practice has resulted in them being classified as unsuitable for vehicular traffic.

OPTIONS	RESPONSIBILITY	ADVANTAGES	DISADVANTAGES
Improve bridges to comply with 1767 Ancholme Act.	NRA/Ministry of Agriculture Fisheries and Food(MAFF).	NRA satisfies its legal obligations. Continued public access.	Cost. Future maintenance.
Close bridges to vehicular traffic.	NRA	Minimises the risk to the public.	Cost of compensation. Reduced public access.
Pass liability to landowners.	NRA	No future NRA liability.	Cost of commuted sum for future maintenance. Landowners unlikely to accept.
Reconstruct bridges.	NRA/MAFF	NRA satisfies legal obligations. Continued public access. Reduced future maintenance.	Cost. Loss of listed buildings.

NB The Ancholme Act 1767: "An Act for the effectual drainage of the lands in the Level of Ancholme and making the River Ancholme navigable."

ISSUE 3

THE STANDARD OF FLOOD FORECASTING PROVIDED FOR MARKET RASEN, MIDDLE RASEN AND WEST RASEN IS INADEQUATE.

BACKGROUND

120 properties in Market Rasen, Middle Rasen and West Rasen were flooded in April 1981 and around 60 properties were affected in October 1993.

Because of a lack of flow gauging in the River Rase and Rainfall Recording Sites within the Rase catchment area it is not possible to provide adequate warning of such events. As a result, damage is caused which could otherwise be avoided.

OPTIONS	RESPONSIBILITY	ADVANTAGES	DISADVANTAGES
Provide additional rain and flow gauging sites on telemetry.	NRA/Ministry of Agriculture,Fisheries and Food.	Improved flood prediction. Earlier warnings possible. Reduced flood damages.	Cost. Future maintenance liability.

ISSUE 4

LOCALLY INADEQUATE RIPARIAN DRAINAGE SYSTEMS EXIST OUTSIDE INTERNAL DRAINAGE BOARD AREAS. UNAUTHORISED CULVERTING, A LACK OF MAINTENANCE AND CONTINUING DEVELOPMENT GIVE RISE TO LAND DRAINAGE PROBLEMS.

BACKGROUND

Localised flooding results as a consequence of insufficient maintenance of riparian watercourses, inappropriate culverting and the insufficient capacity of watercourses to accommodate the increased surface water run-off which follows 'uncontrolled' development.

Ultimately, the responsibility to deal with these problems lies with the riparian owner. Local Authorities who have supervisory powers to resolve this problem are increasingly reluctant to do so because of the resource implications and/or the lack of expertise.

OPTIONS	RESPONSIBILITY	ADVANTAGES	DISADVANTAGES
Enmain watercourses.	NRA/Ministry of Agriculture, Fisheries & Food	Management rests with responsible body.	Lengthy process not appropriate to NRA role.
Extend Internal Drainage Board area.	NRA/Ministry of Agriculture, Fisheries & Food/Internal Drainage Boards.	Management rests with responsible body.	Cost. Lengthy process not appropriate in all cases.
District Councils to use their powers to resolve problems.	Local Authorities.	Management rests with responsible body.	Cost. Lack of appropriate resource or expertise.
Riparian owners to undertake their maintenance responsibilities.	Private owners.		Disjointed approach. Not always practicable.
NRA to ensure new development incorporates appropriate provisions for land drainage.	NRA/Developers.	Future drainage problems are minimised. Costs built into development costs.	Does not address the ongoing maintenance needs.
NRA to liaise with Local Authorities to develop on agreed approach towards this problem.	NRA/Local Planning Authorities/Internal Drainage Boards.	Future drainage problems are minimised.	None.

ISSUE 5

THERE IS INSUFFICIENT MONITORING OF THE RIVER ANCHOLME TO IDENTIFY INTERMITTENT POLLUTION AFFECTING PUBLIC WATER SUPPLYAND OTHER USES.

BACKGROUND

A number of pollution incidents have occurred in the River Ancholme upstream of the public water supply abstraction point at Cadney which the NRA have been unable to identify. The NRA does not have any monitoring facilities on the Ancholme which could provide it with an early warning of such incidents and could help identify the source(s) of this pollution.

OPTIONS	RESPONSIBILITY	ADVANTAGES	DISADVANTAGES
Provide an Automatic Water Quality Monitoring Station upstream of Cadney intake.	NRA.	Would provide early warning of decline in water quality. Would enable a swift investigation by the NRA. Improves water quality.	Cost.
Increase routine monitoring	NRA.	Less cost in the short term.	Short period declines in water quality likely to be missed.

ISSUE 6

A NUMBER OF LANDFILL SITES IN THE CATCHMENT HAVE THE POTENTIAL TO POLLUTE CONTROLLED WATERS.

BACKGROUND

There are 24 operational Waste Disposal Sites in the Catchment. Leachate produced in Waste Disposal Sites is highly polluting if allowed to enter either surface or ground water.

OPTIONS	RESPONSIBILITY	ADVANTAGES	DISADVANTAGES
Promote improved management of leachate.	NRA/Waste Regulatory Authority(WRA)/ Site Operator.	Reduced risk of pollution.	Cost.
Review existing monitoring data.	NRA.	Provide better management information.	
Initiate remedial measures where appropriate.	Site Operator/WRA.	Reduced risk of pollution.	Cost.
Provide effective input into Planning and Waste Disposal Licence Applications.	NRA/WRA.	Ensure that pollution prevention measures are incorporated into future developments.	
Promote waste minimisation.	NRA/Waste Producers. Local Councils.	Less waste to be disposed of.	Partial Solution.

ISSUE 7

A NUMBER OF WATERCOURSES WITHIN THE CATCHMENT FAIL TO ACHIEVE THEIR RIVER ECOSYSTEM TARGET CLASS. (LAND DRAIN, OLD RIVER ANCHOLME, WINTERTON BECK, N KELSEY BECK).

BACKGROUND

The majority of marginal and significant failures against RE targets in the Ancholme Catchment are due to low dissolved oxygen levels possibly associated with eutrophic conditions. Other failures appear to be due to single exceptional results that require further investigation. It is the NRA's intention to review RE Target Classes during 1996.

OPTIONS	RESPONSIBILITY	ADVANTAGES	DISADVANTAGES
Investigate exceptional results for the Winterton Beck and Old River Ancholme.	NRA.	Will determine whether positive remedial action is required to achieve compliance.	
Conduct an investigation into the factors affecting eutrophication in the Land Drain.	NRA.	Will identify any point source nutrient inputs.	
Where appropriate set short-term RE Targets for these watercourses pending outcome of investigations.	NRA.	Provides a step approach to achieving suitable long term targets.	

ISSUE 8

SURFACE WATER FROM LAND CONTAMINATED AS A RESULT OF PAST INDUSTRIAL PRACTICE ADVERSELY AFFECTS WATER QUALITY IN THE UPPER REACHES OF THE WINTERTON BECK.

BACKGROUND

The upper reaches of the Winterton Beck flows through an old blast furnace site. Water Quality is affected by high pH levels and the bed of the watercourse can become covered with a white precipitate which also affects the visual appearance of the Beck.

OPTIONS	RESPONSIBILITY	ADVANTAGES	DISADVANTAGES
Reclamation of site to include removal of contaminated material	Site Owner.	Improved water quality and visual appearance.	Cost to the company.
Continue to monitor.	NRA.	Evaluate the impact of improved water quality. Monitoring costs recovered through the NRA's charges for discharges scheme. Follows polluter pays principle.	

NB This Issue is included in the Humber Estuary CMP Action Plan at Issue 26.

ISSUE 9

INADEQUATE OIL STORAGE FACILITIES WITHIN THE CATCHMENT LEADS TO SERIOUS OIL POLLUTION AFFECTING WATER QUALITY.

BACKGROUND

Water quality within the Catchment is intermittently affected by localised pollution incidents. Many of these incidents are oil related.

Numerous industrial and agricultural sites within the Catchment have oil storage facilities which are not adequately bunded. Accidental spillage or leakage from such tanks and occasional acts of vandalism causes pollution and subsequently environmental damage.

OPTIONS	RESPONSIBILITY	ADVANTAGES	DISADVANTAGES
Carry out pro-active pollution prevention campaigns to identify potential sources of pollutants, and seek the cooperation of site operators.	NRA/Dischargers/ Developers.	Reduced frequency of pollution incidents. Improved water quality. Cost savings on pollution incident investigations.	
Persuade local authorities to include oil pollution prevention measures when granting planning permission.	NRA/Local Authority.	Reduced frequency of pollution incidents. Improved water quality. Cost savings on pollution incident investigations.	
Increase enforcement of pollution control legislation when dealing with individual incidents.	NRA.	Possible reduction in incident frequency. Some improvement in water quality. Follows 'polluter pays' principle.	
Seek additional regulatory powers to require pollution prevention works, on those industrial sites not covered by pollution control legislation.	NRA/Department of the Environment.	Reduced frequency of pollution incidents. Improved water quality. Cost savings on pollution incident investigations.	

ISSUE 10

THE RIVER ANCHOLME EXCEEDS THE NITRATE LEVEL OF 50 MILLIGRAMMES PER LITRE SPECIFIED IN THE EC SURFACE WATER AND NITRATE DIRECTIVES.

BACKGROUND

Agricultural practices within the Catchment have led to the presence of high concentrations of nitrates in the River Ancholme.

The EC Nitrates Directive requires compulsory controls where levels exceed or are at risk of exceeding the 50mg/litre standard set. The zone identified on Map 18 has been proposed as a Nitrate Vulnerable Zone by the Ministry of Agriculture, Fisheries and Food (MAFF)and the Department of the Environment(DoE).

Through this designation, the Ministry aim to change farming practices and water quality improvements are expected to follow.

OPTIONS	RESPONSIBILITY	ADVANTAGES	DISADVANTAGES
Designate Nitrate Vulnerable Zones.	MAFF/DOE	Reduces nitrate concentrations in surface waters. Reduces the need to remove nitrates from drinking water sources.	Cost. Impact on agricultural activity. Improvements likely in the long term only.
Promote 'Code of Good Agricultural Practice for Protection of Water'.	MAFF/NRA	Farmers made aware of need to limit nitrate applications.	Partial solution. NVZ still required.

ISSUE 11

THE WATER QUALITY OF THE LOWER ANCHOLME, WEST DRAIN AND THE LAND DRAIN ARE ADVERSELY AFFECTED BY SALINE INTRUSION.

BACKGROUND

The NRA currently manages saline intrusion on the Ancholme at South Ferriby by a combination of measures. These include transferring saline water from the lock\sluices into the West Drain, the management of the residual flows, lock operation procedures and 2 bubble curtains. Excessive salinity is a particular concern to abstractors in the lower river, in addition the ecological balance of the river is upset and fish mortality can occur. The primary source of this salinity into the Ancholme is thought to be ingress through the tidal structure during navigation/boat movements. The effectiveness of the NRA's management methods and the environmental costs/benefits of this operation are not fully understood.

The impact of saline water discharges from the R. Ancholme on the West Drain is unknown.

OPTIONS	RESPONSIBILITY	ADVANTAGES	DISADVANTAGES
Undertake study to assess the effectiveness of the current salinity management regime, re: residual water flows, leakage through the structure, boat movements, bubble curtains etc. Assess the cost benefit of the management scheme.	NRA.	Will identify the current situation and a baseline for future management of the problem.	
Continue current operation.	NRA.	Partial management of saline intrusion. Provides a level of reliability for users.	Costs. Impact on the West Drain.

ISSUE 12

INADEQUATE LOCAL SEWERAGE SYSTEMS RESULT IN LOCALISED POLLUTION AND MAY HAVE PUBLIC HEALTH IMPLICATIONS.

BACKGROUND

A number of small watercourses and ditches suffer from localised pollution because of inadequate village sewage disposal systems, where discharges to the watercourse are made from septic tank overflows. The problem manifests itself in terms of smell and appearance.

In addition there are a number of unsatisfactory sewer overflows within the catchment which cause localised pollution problems and which have been identified for improvement by AWS in their Asset Management Plan.

OPTIONS	RESPONSIBILITY	ADVANTAGES	DISADVANTAGES
District Councils to requisition sewerage schemes for villages affected.	District Councils/Individual Property Owners/NRA.	Improvement in water quality. Coordinated approach.	Costs.
Individual householders to provide sewage disposal facilities.	Property Owners/Developers/ NRA.	Improvement in water quality.	Piecemeal, uncoordinated approach to the problem. Numerous small sewage plants provide less satisfactory effluent treatment than one large plant.
Cooperative investment in Package Treatment Plant.	Property Owners/Developers/ NRA.	Improvement in water quality. Coordinated approach.	Legal problems. Such initiatives can suffer difficulties arising from joint ownership regarding future maintenance.
Improve existing unsatisfactory sewer overflows.	AWS.	Improvement in water quality.	Cost.

ISSUE 13

THE WEST DRAIN AT SOUTH FERRIBY IS ADVERSELY AFFECTED BY AN INDUSTRIAL DISCHARGE.

BACKGROUND

The high pH level of the discharge causes a precipitate to form in the watercourse which affects the visual appearance of the Drain. Following "authorisation" of the site by Her Majesties Inspectorate of Pollution (HMIP) an improvement plan is underway to resolve this issue.

OPTIONS	RESPONSIBILITY	ADVANTAGES	DISADVANTAGES
Improve effluent quality.	NRA/HMIP/ Discharger.	Improved water quality.	Cost.
Seek alternative route for effluent disposal.	NRA/HMIP/ Discharger.	Discharge ceases.	Need to ensure that problem is not moved to another site. Cost to operator.
Cease discharge: -re-circulate effluent	HMIP/NRA/ Discharger.	Improved water quality	Cost to Discharger.

ISSUE 14

BOAT OWNERS FEEL THAT THE PROVISION OF SERVICES AND FACILITIES ON THE RIVER ANCHOLME NAVIGATION ARE BELOW STANDARD.

BACKGROUND

In 1994 the Anglian Region of the NRA undertook a survey of all registered boat owners. The survey indicated that many boat owners feel they are not getting value for money for their registration fee. The survey identified shortfalls in terms of facilities and services. Facilities include chemical toilet disposal points, pump outs, refuse disposal points, water points and moorings. Services relate to the depth of water and bridge headroom. On the Ancholme users were particularly concerned about excessive weed growth limiting navigation and the waiting time associated with South Ferriby Lock.

OPTIONS	RESPONSIBILITY	ADVANTAGES	DISADVANTAGES
Increase the provision of services and facilities on the navigation.	NRA, Local Authorities.	Improved facilities for boat users.	Provision of facilities needs to be balanced with level of use.
Reduce waiting times at South Ferriby Lock.	NRA.	More efficient service for boat users.	Potential high cost for automation of the lock.
Undertake weed control specifically for navigation purposes.	NRA.	Improved passage for boats.	Cost.

ISSUE 15

THE PHYSICAL STRUCTURE OF SOUTH FERRIBY LOCK HAS DETERIORATED AND THIS HAS THE POTENTIAL TO CLOSE THE NAVIGATION.

BACKGROUND

South Ferriby Lock was constructed in 1844. The 8 doors were refurbished with new timbers, etc in 1944. However, since that time no major repairs have been undertaken. The lock doors leak and the timbers are rotten in places. The stone structure appears sound.

OPTIONS	RESPONSIBILITY	ADVANTAGES	DISADVANTAGES
Assess the state of the lock structure and undertake any necessary repairs.	NRA.	Maintain the navigation. Improved safety.	High cost.

ISSUE 16

BOATS ARE UNABLE TO CRUISE THE FULL LENGTH OF THE ANCHOLME NAVIGATION BECAUSE OF THE DERELICT HARLAM HILL LOCK.

BACKGROUND

In 1992/93, the Inland Waterways Association with the NRA's cooperation began work to restore the Lock at Harlam Hill to an operational condition. The Ancholme Navigation extends four kilometres upstream of the lock and therefore its restoration would increase the cruising distance to boat users.

OPTIONS	RESPONSIBILITY	ADVANTAGES	DISADVANTAGES
Restore Lock.	Inland Waterways Association \ NRA.	Increase cruise length by 4km.	Cost.

ISSUE 17

AREAS OF RIVER CHANNEL AND RIVER CORRIDOR HAVE BEEN IDENTIFIED AS HAVING LOW PLANT SPECIES DIVERSITY.

BACKGROUND

Intensively managed rivers are subject to works aimed primarily at supporting the land drainage function. The resultant river channel lacks features that influence the plant community it could support. The ecological value of the banksides and wetted margin of these rivers is degraded and of little significance.

OPTIONS	RESPONSIBILITY	ADVANTAGES	DISADVANTAGES
Restore and enhance during routine Flood Defence maintenance or Capital Works without loss of channel capacity, eg washlands.	NRA.	Increased plant and habitat diversity. Environmental gain to other higher organisms, ie fish. Ecological stability.	Cost of Flood Defence works is increased.
Encourage landowners to restore wetland and riparian habitats, eg Buffer Zones (Countryside Stewardship, Set Aside Schemes, etc).	NRA, Landowners, Countryside Commission, MAFF, Farming & Wildlife Advisory Group.	Increased plant and habitat diversity. Shared costs. Grants/funding may be available from other bodies. Recreation and amenity value enhanced.	Cost.
Encourage farmers to graze embanked watercourses with stock on selected sites.	NRA.	Increased plant species diversity. Reduced maintenance costs for NRA.	Conflict of interests between tenant and other river users.

ISSUE 18

THE CATCHMENT HAS LOST ALL OF ITS NATURAL FENLAND HABITAT.

BACKGROUND

Serious attempts to drain the marshes and low fens of this catchment started in 1635 by Sir John Munson, but as late as 1830, between 5-6,000 acres were still flooded each winter. Over the last century however, intensive agricultural practices have resulted in the fenlands being fully drained to increase its productivity and economic value. The consequence of this has been the loss of an environmentally important habitat along with its associated flora and fauna.

OPTIONS	RESPONSIBILITY	ADVANTAGES	DISADVANTAGES
The NRA should encourage any practical schemes which seek to restore natural fenland habitat.	NRA, Landowners, Fisheries & Wildlife Advisory Group, Countryside Commission. MAFF.	Increased diversity of flora and fauna and habitat. Possible flood defence benefit. Reduction in flood peak timing.	Cost.
The NRA should consider the feasibility of enhancing habitat during both routine maintenance works and capital works.	NRA.	Increased diversity of flora and fauna and habitat. Associated Flood Defence benefits of Washlands.	Cost of flood defence works may increase.

ISSUE 19

CONFLICT EXISTS BETWEEN THE NEEDS OF THE IDB TO MAINTAIN ALL OF ITS GRAVITY OUTFALLS INTO THE ANCHOLME AND THE NRA TO MANAGE RIVER LEVELS FOR ABSTRACTION PURPOSES.

Background

Until the early 1990's it was normal practice to lower the level in the River Ancholme to +0.15m ODN for a 2 or 3 week period each year, outside of the navigation season. Normal retention level in the navigation season (April to October) is +1.2 m ODN and outside of the season is +0.9m ODN.

The level was lowered to +0.15 to allow Ancholme Internal Drainage Board to maintain their gravity outfall flap valves and structures. NRA have used this period to carry out bank maintenance and survey.

In recent years it has been the practice to only lower the level to +0.4m ODN as a result of environmental concerns and the increased importance of the river for abstraction purposes. The result of this change in practice has been that the IDB are unable to properly maintain 12 of their structures.

OPTIONS	RESPONSIBILITY	ADVANTAGES	DISADVANTAGES
Revert to practice of lowering levels to +0.15m.	NRA	IDB outfall maintenance possible at no additional cost.	Interruption to supply for abstractors. Possible environmental damage.
Provide facilities to de-water IDB structures locally	NRA/Internal Drainage Board (IDB)	IDB outfall maintenance possible. Improved security of supply to abstractors	Cost

ISSUE 20

THERE IS INSUFFICIENT INFORMATION AVAILABLE ON THE ENVIRONMENTAL EFFECT OF GROUNDWATER ABSTRACTION IN THE WADDINGHAM AND REDBOURNE AREA.

BACKGROUND

Anglian Water Services abstract water from three sources in the Waddingham/Redbourne area which were the subject of applications for licence variations in 1993/94. As a consequence of NRA concern for the impact of these abstraction changes upon the local water environment, NRA granted licence variations in 1994 for 3 years, conditional upon Anglian Water Services carrying out environmental surveys. This approach is in line with our precautionary principle.

OPTIONS	RESPONSIBILITY	ADVANTAGES	DISADVANTAGES
Carry out environmental surveys of potentially affected areas and implement defined remedial actions.	Anglian Water Services/NRA	Better understanding of environmental impact.	Costs to AWS.

ISSUE 21

THE ABILITY TO MANAGE THE TWA SCHEME AND RESIDUAL FLOWS TO TIDE IS LIMITED BY A LACK OF INFORMATION ON RIVER FLOW AND DAY TO DAY INFORMATION ON MAJOR ABSTRACTIONS FROM THE LOWER RIVER ANCHOLME.

Background

The TWA Scheme is designed to transfer water to meet abstraction needs, to support the navigation and to manage water quality. Currently the NRA collects weekly forecast abstraction details from the 2 major abstractors, Anglian Water and Brigg Power Station. The NRA attempts to maintain a 5 TCMD (thousand cubic metres per day) flow to tide. The NRA must balance the transfer of sufficient water to meet these needs.

There are currently no river gauging stations on the Lower Ancholme to assist in managing the control of river flows.

OPTIONS	RESPONSIBILITY	ADVANTAGES	DISADVANTAGES
Construct a flow gauging station.	NRA.	Provides information on flows and facilitates improved management of saline intrusion and residual flows to tide. Increases the efficiency of operating the river transfer. Effective management of transfers will be required as the rate of river transfers increases to meet rising demands. Improved information for flood warning purposes.	Cost. Changes in water conductivity may interfere with gauging accuracy.
Continue current practices	NRA		Ineffective management of resources that will become more critical as demands increase. Inefficient operation.
Install/commission telemetry on major abstractions.	NRA	Better day to day management information. Greater efficiency in operation - reduced costs. Better management of saline intrusion.	Cost

ISSUE 22

FISH BIOMASS AND FISH SPECIES RICHNESS FALL BELOW THE TARGET STANDARDS ALONG LENGTHS OF THE WEST DRAIN, WINTERTON BECK, RIVER RASE AND THE LAND DRAIN.

BACKGROUND

Fisheries' survey work indicates the desired standard for fisheries status is not being achieved for these watercourses within this catchment. The reasons are unclear and require further investigation to identify possible courses and solutions.

OPTIONS	RESPONSIBILITY	ADVANTAGES	DISADVANTAGES
Undertake an environmental analysis of problem watercourses.	NRA.	Improve fisheries potential. Environmental improvements identified.	Cost.
Additional fisheries surveys to focus on problem sites.	NRA.	More specific data.	Cost.

ISSUE 23

FISH SPECIES RICHNESS IS POOR ON THE MAIN RIVER ANCHOLME (CLASS C/D) IN CERTAIN LOCATIONS.

BACKGROUND

Although fish biomass is excellent on the lower Ancholme fish species diversity is poor in certain locations. Improvements are sought to achieve target standard. Poor riverine habitat is known to have had an impact on a number of specialised aquatic invertebrates; it may also adversely influence the fishery status.

OPTIONS	RESPONSIBILITY	ADVANTAGES	DISADVANTAGES
Improve habitats through marginal vegetation on berms, tree planting, etc.	NRA, County and Local Councils, Landowners, Angling Interests, Countryside Commissioners, MAFF.	Long term improvement. Improves capacity of river to support fisheries and wildlife interests. Recreational enhancement.	Cost.
Improve habitats through routine flood defence maintenance or capital works.	NRA.	Improves capacity of river to support fisheries and wildlife interests. Associated flood defence benefits, eg washlands. Recreational enhancement.	Cost.
Re-stock with suitable fish species.	NRA Angling Clubs Landowners.	Immediate fix.	Short term solution. River may not support the stock.

ISSUE 24

THE CURRENT DEVELOPMENT AND GROWTH OF RECREATIONAL DEMANDS WITHIN THE CATCHMENT ARE UNCO-ORDINATED.

BACKGROUND

Co-ordinated development of the Catchment's recreational resource is required to meet the increasing demands of users.

Access along sections of river bank has been lost because of bank erosion.

The Ancholme Users Group provides a forum for discussion of recreational activities on the river system.

OPTIONS	RESPONSIBILITY	ADVANTAGES	DISADVANTAGES
Conduct a study to assess potential and capacity of recreational resources.	NRA, Glanford Borough Council, Brigg District Council, Glanford Countryside Project, Ancholme Users Group.	Provides recommendations to balance resources and future input with user groups.	Cost.
Ad hoc development of recreational needs.	NRA, Glanford Borough Council, Brigg District Council, Glanford Countryside Project, Ancholme Users Group.		Piecemeal approach. Under use of facilities leads to conflicts between user groups.

ISSUE 25

MEMBERS OF THE PUBLIC ARE UNAWARE OF THE DANGERS ASSOCIATED WITH SWIMMING IN RIVERS.

Background

During warm periods and school holidays reports have been received of children swimming in the river and jumping from structures into the river.

There are inherent dangers from weeds, underwater structures and undercurrents which can endanger even the strongest swimmers. There is also the risk of catching waterborne illnesses eg Weils disease.

OPTIONS	RESPONSIBILITY	ADVANTAGES	DISADVANTAGES
Publicise dangers to the public at appropriate times of the year.	NRA Local Authorities School.	Improved education of dangers.	Message may not reach those most at risk. Message may be ignored. Awareness of danger may attract irresponsible people.
Erect signs to warn of dangers.	NRA District and County Councils.	Fulfils duty of care.	Loss through vandalism.
Restrict public access to structures.	NRA Local Authority.	May discourage opportunists.	Some have right of way. May encourage trespass. Hard to enforce.

ISSUE 26

CHANGES IN LAND USE AND DEVELOPMENT POSE A RISK TO THE SUSTAINABILITY OF THE WATER ENVIRONMENT.

BACKGROUND

Development and change in land use can bring with them the risk of: increased flooding through changes in surface water run-off, increased pollution through increased effluent discharges to ground and surface water, and a threat to the flora and fauna associated with the water environment.

Through the planning process the NRA seeks to minimise the impact of development proposals on the water environment by liaising with PA's and developers.

OPTIONS	RESPONSIBILITY	ADVANTAGES	DISADVANTAGES
Increase the NRA's influence in the Planning process.	NRA/Planning Authorities.	Reduces the potential harm to the water environment from development and change in land use.	
Increase the awareness of developers of risks to the water environment.	NRA/Developers/ Planning Authorities.	Reduces the potential harm to the water environment from development and change in land use.	
Establish the effectiveness of current practices.	NRA.	Identifies any weaknesses in the current system.	

ISSUE 27

THE EVALUATION OF THE CONSERVATION STATUS OF HABITATS WITHIN THE CATCHMENT RELIES SOLELY ON SPECIES DIVERSITY.

BACKGROUND

Further information on the qualitative and quantitative value of marginal reedbeds, river side trees and shrubs would assist in the habitat valuation of the catchments rivers. At the present time current survey and analysis methodologies are unable to provide an objective status.

OPTIONS	RESPONSIBILITY	ADVANTAGES	DISADVANTAGES
Improve survey methodologies to accurately measure habitats and increase analytical capacity of database.	NRA.	Greater accuracy and weight to conservation valuations. Improve maintenance and enhancement of environment during maintenance and capital works. Assist to meet Agenda 21 (sustainability criteria).	Cost.

ISSUE 28

RECREATION AND NAVIGATION ON THE RIVER ANCHOLME IS RESTRICTED AT TIMES BY EXCESSIVE WEED GROWTH

BACKGROUND

During summer months excessive weed growth on the main River Ancholme has resulted in the restriction of recreation and navigational uses. Floating weed eg. duckweed and algae cause particular difficulties to anglers and boat users and results in numerous complaints.

Weed growth arises as a consequence of the enrichment of water with nutrients arising from surface water run-off from agricultural land and sewage treatment discharges.

The NRA currently undertake annual weed control on the Ancholme for flood defence purposes which involves cutting the weeds with a weed boat.

OPTIONS	RESPONSIBILITY	ADVANTAGES	DISADVANTAGES
Review the effectiveness of current NRA weed management practices to meet recreation and navigation needs.	NRA	Improve recreation and navigation use. Improve flood protection. Reduce enrichment.	Cost.
Assess methods to reduce nutrient enrichment.	NRA Dischargers MAFF	Improved understanding of the cause of the problem and possible solutions	

ISSUE 29

THE MANAGEMENT OF RIVER LEVELS IN THE RIVER ANCHOLME TAKES NO ACCOUNT OF PREVAILING "CATCHMENT" CONDITIONS.

BACKGROUND

The level of the Ancholme is currently managed so that on certain dates of the year river levels are changed from summer to winter and vice versa by controlling gates at South Ferriby. This method of river management is not sensitive to prevailing catchment conditions, particularly during very dry periods.

Normal summer (April to October) retention level is + 1.2m ODN and normal winter level is +0.9m ODN.

OPTIONS	RESPONSIBILITY	ADVANTAGES	DISADVANTAGES
Continue as present	NRA.	No monitoring required.	The unnecessary discharge of water to the Humber and increased costs of water transfer.
Review alternative methods of managing river levels and their legal implications.	NRA.	Improved understanding of River management.	Potential conflicts with other users from any subsequent change in river management.

TYPE	NRA REF	SITE/LOCATION	NGR	TELEMETRY	USE											
					A	B	C	D	E	F	G	H	I	J	K	L
RG	029004	Ancholme, Bishopbridge	TF 031911	Y	✓	✓	✓	✓	✓	✓		✓	✓			
RG	029009	Ancholme, Toft Newton	TF 032874	Y			✓		✓	✓		✓	✓			
RC	290703	Appelby Beck, Appelby	SE 950147	N						✓		✓	✓			
RC	290702	Appelby Mill, B.Appelby	SE 952133	N						✓		✓	✓			
RC	290710	Appelby Beck, D/S B.S. Outlet	SE 950147	N						✓		✓	✓			
RC	290208	Bayons Beck, N. Willingham	TF 151891	N						✓		✓	✓			
RL		Brandy Wharf	TF 015971	Y	✓	✓	✓	✓	✓	✓		✓	✓			
RL		Brigg	SE 993069	Y	✓	✓	✓		✓	✓		✓	✓			
RS		Broughton Bridge	SE 985105	Y					✓				✓			
SR	S16	Cadney	SE 996053	Y	✓	✓	✓									
RC	290420	Caistor Beck, Caistor	TA 113018	N						✓		✓	✓			
RC	290480	Cherry Valley, Grasby Road	TA 074024	N				✓		✓		✓	✓			
RC	290481	Cutley Beck, Cutley Bridge	TA 063018	N						✓		✓	✓			
RC	290413	Drain, Caistor	TA 109012	N						✓		✓	✓			
BO		Eastfield Farm	SK 989972	P PH3												
RC	290804	Elsham Beck, Elsham	TA 024116	N						✓		✓	✓			
SR		Ferriby Sluice (Rainguage)	SE 974210	Y	✓	✓	✓									

TYPE	REF	SITE/LOCATION	NGR	TELEMETRY	USE											
					A	B	C	D	E	F	G	H	I	J	K	L
TL		Ferriby Sluice D/S	SE 975211	Y	✓	✓	✓		✓	✓		✓	✓			
RL		Ferriby Sluice U/S	SE 975211	Y	✓	✓	✓	✓	✓	✓		✓	✓			
RC	290441	Grasby Beck, Grasby	TA 081037	N						✓		✓	✓			
RC	290414	Holton Beck, Moortown	TF 074988	N						✓		✓	✓			
RC	290433	Kettleby Beck, Kettleby	TA 036066	N				✓		✓		✓	✓			
RG		Kingerby Beck	TF 045932	P PH3			✓		✓	✓		✓	✓			
RL		Market Rasen	TF 111893	Y	✓	✓	✓									
RG	029013	Moor Beck, Clapgate Farm	SE 966112	Y					✓	✓		✓	✓			
RG	029023	Nettleton Beck, Moortown	TF 071991	Y			✓	✓	✓	✓		✓	✓			
RC	290412	Nettleton Beck, Nettleton	TA 109001	N						✓		✓	✓			
RG	029012	North Kelsey Beck	TA 048032	Y	✓		✓		✓	✓	✓	✓	✓			
RC	290408	Owersby Beck, Holton Station	TF 092972	N						✓		✓	✓			
RC	290103	Owmby Beck, Owmby	TF 008872	N						✓		✓	✓			
RC	290104	Paunch Beck, Normandy	SK 998881	N				✓		✓		✓	✓			
RC	290220	R Rase, Tributary Market Rasen	TF 114889	N						✓		✓	✓			
RG	029005	Rase, Bishopbridge	TF 032912	Y	✓	✓	✓	✓	✓	✓		✓	✓			
RC	290314	Redborough Old River, Redbourne	SE 983002	N						✓		✓	✓			
RC	290205	River Rase, Bully Hill	TF 168919	N						✓		✓	✓			

TYPE	REF	SITE/LOCATION	NGR	TELEMETRY	USE											
					A	B	C	D	E	F	G	H	I	J	K	L
RC	290206	River Rase, Tealby Thorpe	TF 149901	N						✓		✓	✓			
RS		Saxby All Saints	SE 971164	Y						✓			✓			
RC	290382	Scawby Brook, Castlethorpe	SE 981065	N						✓		✓	✓			
RC	290310	Scawby Brook, Scawby	SE 964063	N						✓		✓	✓			
RC	290301	Seggimoor.B, Glentham	TF 001906	N				✓		✓		✓	✓			
RC	290439	Skegger Beck, Kettleby	TA 035072	N				✓		✓		✓	✓			
RC	290101	Spridlington.B, Spridlington	TF 008851	N						✓		✓	✓			
RC	290383	Spring Dyke, Castlethorpe	SE 984076	N						✓		✓	✓			
SR	SO1	Toft Newton (T)	TF 033873	Y	✓	✓	✓									
RL		Toft Newton Reservoir	TF 032874	Y					✓	✓						
RC	290407	Tributary, Owersby.B, Claxby Moor	TF 091966	N						✓		✓	✓			
RC	290482	Usselby Beck, Jews Bridge	TF 097936	N				✓		✓		✓	✓			
RC	290401	Usselby Beck, Walesby	TF 128928	N						✓		✓	✓			
RG	029011	Waddingham	TF 002962	Y			✓		✓	✓		✓	✓			
RC	290306	Waddingham.B, Waddingham	SK 980965	N						✓		✓	✓			
RC	290707	Wint' Parish.D, Winterton	SE 939181	N				✓		✓		✓	✓			

TYPE	REF	SITE/LOCATION	NGR	TELEMETRY	USE											
					A	B	C	D	E	F	G	H	I	J	K	L
RL		Winterton Beck O/F	SE 935231	Y												
RC	290681	Winterton Beck, West Halton	SE 911203	N						✓		✓	✓			
BO		Winterton Carr Lane	SE 947187	P PH3												
RL		Scabcroft T/G	SE 967183	Y												

KEY

TYPE

RL - River Level
RC - River Flow Current Meter
RG - River Flow Gauging Station
BO - Borehole Level
SR - Raingauge
TL - Tide Level
RS - Salinity Level

Y - Telemetry Output
N - No Telemetry
P PH3 - Telemetry Proposed in ARTS Phase 3

USE

A - Flood Warning
B - Flood Control
C - Investigations (Flood Defence)
D - Abstraction Control
E - Transfer/Augmentation
F - Investigations (Water Resources)
G - Consents/Control
H - Pollution Incidents
I - Investigations (Water Quality)
J - Fisheries
K - Conservation
L - Navigation

HYDROMETRIC NETWORK (NON TELEMETRY)

1. GROUNDWATER OBSERVATION BOREHOLES

SITE	GRID REFERENCE
Spridlington Exp	TF 0061 8421
Cliff Road, Spridlington	SK 9897 8387
Saxby Exp	SK 9858 8579
Bully Hill	TF 1734 9202
Glentworth	SK 9555 8946
Glentham Village	TF 0008 9111
Atterby Cliff	SK 9678 9266
Caenby Exploratory	SK 9993 8948
Scawby	SE 9808 0613
Ermine St, Broughton	SE 9564 0753
Ermine St, Hibaldstow	SE 9613 0307
Redbourne Village	SK 9722 9872
Grayingham Wright	SK 9594 9600
Stoneholmes South	SK 9834 9971
Brigg	SE 9999 0596
Scabcroft Winterton	SE 9675 1809
Winterton Mere	SE 9332 2006
Ermine Street, Appleby	SE 9500 1432
Mickleholme	SK 9511 1638

2. RAINGAUGES

Ferriby Sluice	SE 975 267
Scawby Hall	SE 968 057
High Risby	SE 920 147
Snitterby	SK 990 948
Appleby Lodge Farm	SE 961 110
West Halton	SE 905 206
Brigg St Clares Walk	TA 002 071

APPENDIX 2

FISHERIES CLASSIFICATION SYSTEMS

Fish population surveys are normally undertaken on a 3 year rolling programme which covers the principal rivers/drains in the Area.

The data collected has been used to calculate the following classification systems, which are part of a national fisheries classification system. This system will enable fisheries throughout England and Wales to be compared in a standard way, taking into account broad habitat types.

BIOMASS AND DENSITY CLASSIFICATION

Absolute

This system compares coarse fish abundance in terms of a g/100m² for the total coarse fish population. For salmonid species abundance is gauged in terms of No/100m².

The class or grades are:

	COARSE SPECIES g.100m²	SALMONID SPECIES No. 100m⁻²
A	3291 or 33 gm⁻²	62
B	1935 or 19.4gm⁻²	43
C	1029 or 10.3 gm⁻²	31
D	371 or 3.7 gm⁻²	18
E	0	0
F	No coarse fish caught	No salmonid fish caught

Figure 1

SPECIES RICHNESS

Species richness refers to the total number of individual species occurring within the survey area. This is a relative measure as river gradient and width zone are taken into account.

River width is classified into 1 of 4 zones:

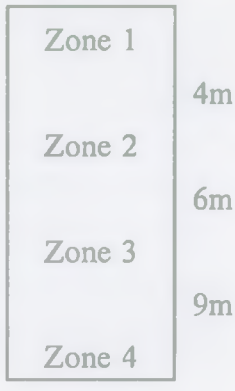


Figure 4

For example:

Data:	Width	30.m
	Gradient	10m.km
	Total number of species	6

Using Figure 2 the species richness classification is A.

In a natural river system the lowland reaches would be expected to support a greater number of fish species than upland reaches. By incorporating river width and gradient into the 'species richness' classification this bias is largely removed.

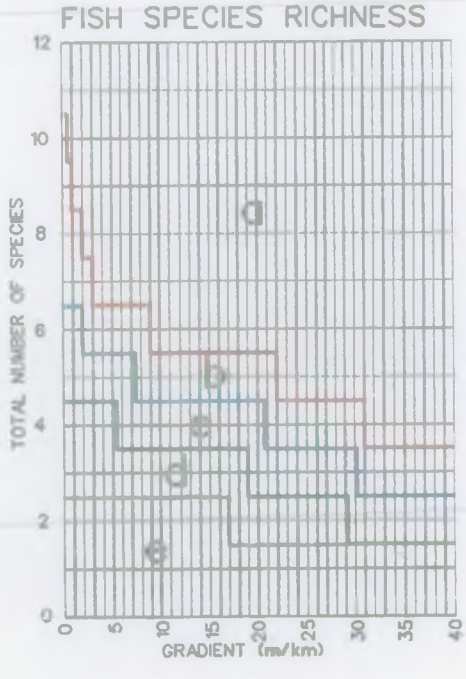


Figure 5

Relative

This system uses the biomass data for coarse fish without eels. Consideration of the river gradient and width zone means that fish abundance is compared at the site to be classified with all other sites in the same broad habitat.

Example 1

Data:		
	Width	4.2 metres
	Gradient	1.5m km
	Total biomass	2000 g/100m²

From Fig.1 this means CLASS B status is achieved.

The advantage of the relative system is that it includes information on river features and natural bias in the data. For example, an upland stream would not be expected to achieve a biomass much greater than 1000 g/100m² whereas a large lowland river system would be expected to achieve a biomass greater than 3000 g/100m².

The classes described by this scheme are:-

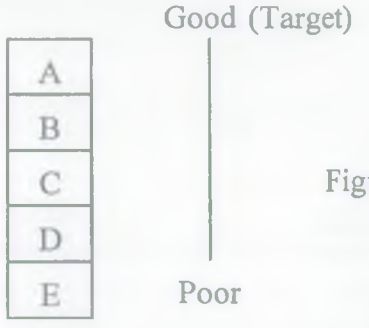


Figure 2

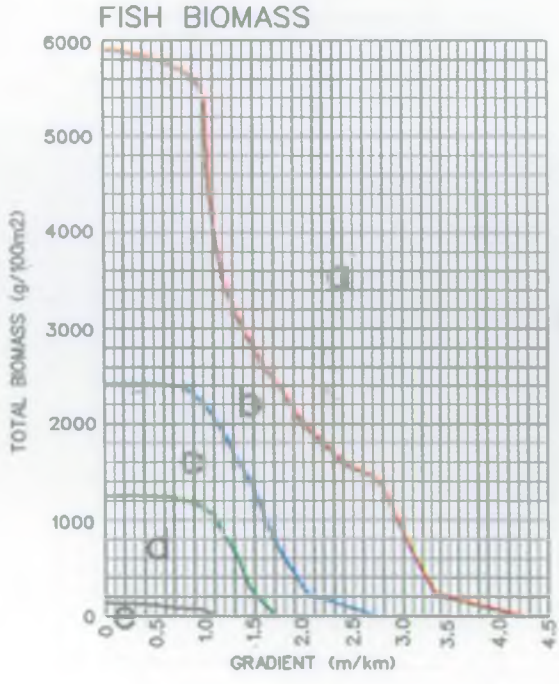


Figure 3

GENERAL QUALITY ASSESSMENT: CHEMICAL GRADING FOR RIVERS AND CANALS

Water Quality	Grade	Dissolved Oxygen (% saturation) 10 percentile	Biochemical Oxygen Demand (ATU*) (mg/l) 90 percentile	Ammonia (mg H/1) 90 percentile
Good	A	80	2.5	0.25
	B	70	4	0.6
Fair	C	60	6	1.3
	D	50	8	2.5
Poor	E	20	15	9.0
Bad	F**	-	-	-

* as suppressed by adding allyl thio-urea

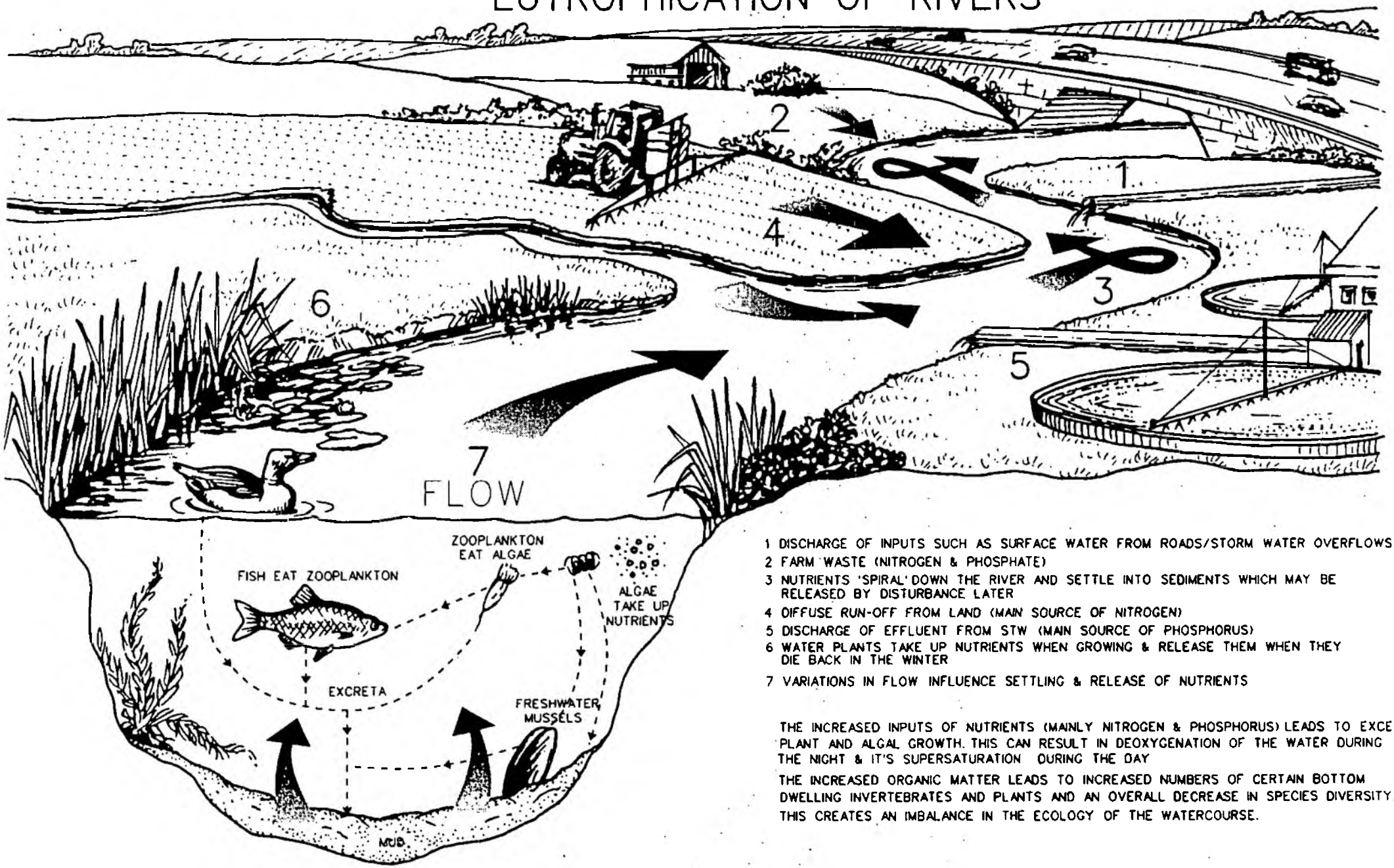
** ie quality which does not meet the requirements of grade E in respect of one or more determinands

BIOLOGICAL CLASSIFICATION OF WATER QUALITY

Some invertebrates are more susceptible to pollution than others and so the presence of such sensitive species is a sign that water quality is good. Each biological sample is given a score according to the number and type of invertebrates present. This is known as the Biological Monitoring Working Party (BMWP) score. It assigns points to each taxon according to its sensitivity to pollution. For example, many mayfly nymphs and caddis larvae score ten points, water beetles score five, molluscs three and worms one. The BMWP score is then divided by the number of scoring taxa to give the Average Score Per Taxon (ASPT). This gives an indication of the contribution made by each to the total. The higher these two scores, the cleaner the water. These two scores are ranked and assigned a rating of one to seven. The mean of these two ratings is called the Lincoln Quality Index (LQI). Thus each sampling site is given a LQI score, which is assessed against the target LQI for that site.

Another system used to assess biological quality is the River In Vertebrate Prediction and Classification System (RIVPACS). This is a computer programme developed by the Institute of Freshwater Ecology which can predict, from the physical and chemical characteristics of a site, the likely BMWP score which would be found assuming the site was unpolluted and undisturbed. A comparison is then made between the actual and predicted scores and the site classified between A and D; A if the fauna are close to that predicted, and thus unpolluted, and D if not.

EUTROPHICATION OF RIVERS



DECOMPOSITION & DISTURBANCE (EG DREDGING & FLOODS) OF MUD RELEASES PHOSPHORUS

1 DISCHARGE OF INPUTS SUCH AS SURFACE WATER FROM ROADS/STORM WATER OVERFLOWS
2 FARM WASTE (NITROGEN & PHOSPHATE)
3 NUTRIENTS 'SPIRAL' DOWN THE RIVER AND SETTLE INTO SEDIMENTS WHICH MAY BE RELEASED BY DISTURBANCE LATER
4 DIFFUSE RUN-OFF FROM LAND (MAIN SOURCE OF NITROGEN)
5 DISCHARGE OF EFFLUENT FROM STW (MAIN SOURCE OF PHOSPHORUS)
6 WATER PLANTS TAKE UP NUTRIENTS WHEN GROWING & RELEASE THEM WHEN THEY DIE BACK IN THE WINTER
7 VARIATIONS IN FLOW INFLUENCE SETTLING & RELEASE OF NUTRIENTS

THE INCREASED INPUTS OF NUTRIENTS (MAINLY NITROGEN & PHOSPHORUS) LEADS TO EXCESSIVE PLANT AND ALGAL GROWTH. THIS CAN RESULT IN DEOXYGENATION OF THE WATER DURING THE NIGHT & IT'S SUPERSATURATION DURING THE DAY

THE INCREASED ORGANIC MATTER LEADS TO INCREASED NUMBERS OF CERTAIN BOTTOM DWELLING INVERTEBRATES AND PLANTS AND AN OVERALL DECREASE IN SPECIES DIVERSITY. THIS CREATES AN IMBALANCE IN THE ECOLOGY OF THE WATERCOURSE.

RIVER ECOSYSTEM CLASSIFICATIONS

(1) Class	(2) Dissolved Oxygen % saturation 10 percentile	(3) BOD (ATU) mg/l 90 percentile	(4) Total Ammonia mg N/l 95 percentile	(5) Un-ionised Ammonia mg N/l 95 percentile	(6) pH lower limit as 5 percentile; upper limit as 95 percentile	(7) Hardness mg/l $CaCO_3$	(8) Dissolved Copper µg/l 95 percentile	(9) Total Zinc µg/l 95 percentile	Class Description
RE1	80	2.5	0.25	0.021	6.0 - 9.0	≤ 10 > 10 and ≤ 50 > 50 and ≤ 100 > 100	5 22 40 112	30 200 300 500	Water of very good quality suitable for all fish species
RE2	70	4.0	0.6	0.021	6.0 - 9.0	≤ 10 > 10 and ≤ 50 > 50 and ≤ 100 > 100	5 22 40 112	30 200 300 500	Water of good quality suitable for all fish species
RE3	60	6.0	1.3	0.021	6.0 - 9.0	≤ 10 > 10 and ≤ 50 > 50 and ≤ 100 > 100	5 22 40 112	30 700 1000 2000	Water of fair quality suitable for high class coarse fish populations
RE4	50	8.0	2.5	-	6.0 - 9.0	≤ 10 > 10 and ≤ 50 > 50 and ≤ 100 > 100	5 22 40 112	30 700 1000 2000	Water of fair quality suitable for coarse fish populations
RE5	20	15.0	9.0	-	-	-	-	-	Water of poor quality which is likely to limit coarse fish populations

APPENDIX 7

EC DIRECTIVES

1. EC Surface Water Abstraction Directive 75/440/EEC
2. EC Groundwater Directive 80/68/EEC
3. EC Urban Waste Water Treatment Directive 91/271/EEC
4. EC Nitrate Directive 91/676/EEC
5. EC Protection of the Quality of Groundwater Directive 80/68/EEC
6. EC Bathing Water Directive 76/160/EEC
7. EC Freshwater Fisheries Directive 78/659/EEC
8. EC Shellfish Waters Directive 79/923/EEC
9. EC Shellfish Hygiene Directive 91/492/EEC
10. EC Dangerous Substances Directive 76/464/EEC
11. EC Birds Directive 79/409/EEC
12. EC Habitats Directive 94/43/EEC

CATCHMENT PLANNING TEAM

I Forbes	Project Leader/FRCN Manager
R Kisby	Catchment Planning Officer/Planning Liaison
D Watling	Water Resources
A Court	Water Resources
C Noble	Flood Defence
M Tartellin	Fisheries, Recreation, Conservation & Navigation
D Hawley	Water Quality

CATCHMENT PANEL MEMBERS

I Biddick	Humberside County Council
N Playne	Country Landowners Association
T Richards	Lincolnshire Anglers Consultative
T Wilson	Lincolnshire Anglers Consultative
D Carnell	Inland Waterways Association
M Crick	Lincolnshire Wildlife Association
R Spaight	Salmon & Trout Association
T Coles	Institute of Environmental Assessment
R Harvey	British Waterways
R B Shields	East Lindsey District Council
C Middleton	West Lindsey District Council
J Shackles	English Nature
R Wardle	Countryside Commission
N Boast	Chemical Industries Association
P Bird	Eel Fishermen
P Thompson	Tioxide UK
P Fisher	RSPB
E Smith	Anglian Water Services Ltd
J Dodsworth	Lincolnshire LFDC
G Keeping	Lincolnshire County Council

GLOSSARY

Abstraction	The removal of water from any source, either permanently or temporarily.
Abstraction Licence	A statutory document issued by the NRA to permit removal of water from a source of supply. It can limit the quantity of water taken daily etc.
Agenda 21	A comprehensive programme of worldwide action to achieve a more sustainable pattern of development for the next century. UK Government adopted the declaration at the UN Conference on Environment and Development (the Earth Summit) held in Rio de Janeiro in 1992.
Algae	Microscopic (sometimes larger) plants, which may be floating or attached. Algae occur in still and flowing water.
Algal blooms	Rapid growth of phytoplankton in marine and freshwaters which may colour the water and may accumulate on the surface as a green scum. Decomposing dead cells consume large quantities of oxygen in the water which may result in the waters becoming anaerobic. Some blooms (such as certain species of blue-green algae) may produce poisons.
Ammonia	A chemical compound found in water often as a result of pollution by sewage effluents. It is widely used to determine water quality. Ammonia detrimentally affects fish.
AMP2	An acronym for the second Asset Management Plan produced by the Water Companies for the Office of Water Services (OFWAT). It sets out the water industry investment programme for the period 1995 to 2005.
AOD (Above Ordnance Datum)	Land levels are measured relative to the average sea level at Newlyn in Cornwall. This average level is referred to as 'Ordnance Datum'. Contours on Ordnance Survey maps of the UK show heights in metres above Ordnance Datum.
Aquatic	Pertaining to the water environment.
Aquifer	A water bearing-stratum situated below ground level. The water contained in aquifers is known as groundwater.
Attenuation	Breakdown or dilution of a contaminant in water.
Augmentation	The addition of water by artificial input. (Usually to "top up" low flows in summer by either groundwater pumping or via reservoir release.)
Biochemical Oxygen Demand (BOD)	A standard test which measures over 5 days the amount of oxygen taken up by aerobic bacteria to oxidise organic (and some inorganic) matter.
Biodegradable	Capable of being decomposed by bacteria or other biological means.
Bio-diversity	Diversity of biological life, the number of species present.
Biomass	Total quantity or weight of organisms in a given area or volume - e.g. fish biomass is measured as grammes per square metre (gm^{-2}).
Blue-Green Algae	Ubiquitous, usually microscopic plankton with properties characteristic of both bacteria and algae. In still, calm conditions they can grow to excess to form dense blooms and scums, and are known to produce chemicals toxic to mammals.
Borehole	Well sunk into a water bearing rock.
Brundtland Report	Report of the 1987 World Commission on Environment and Development.
Bubble Curtain	A perforated pipe laid across the river and secured to the bed. Compressed air passes through the pipe such that bubbles form a 'curtain' in the water column. The curtain helps to prevent the passage of the heavier saline water from one side of the curtain to the other by a circulatory/mixing action.
Buffer Zone	Strip of land 10-100m wide, alongside rivers which is removed from intensive agricultural use and managed to provide appropriate habitat types.

Catchment	The total area from which a single river system collects surface run-off.
Coarse Fish	Freshwater fish other than salmon and trout.
Coastal and Estuarine Working Party Classification	A historical summary of the quality of estuarine waters based on points awarded for biological, aesthetic and water quality. Will be overtaken by coastal/estuarine GQA.
Consent (Discharge)	A statutory document issued by the NRA. It can authorise entry and indicate any limits and conditions on the discharge of an effluent to a Controlled Water. A land drainage consent is an approval for specified structural works in areas under NRA control.
Controlled Waters	All rivers, canals, lakes, groundwaters, estuaries and coastal waters to three nautical miles from the shore, including the bed and channel which may for the time being be dry.
Countryside Stewardship Scheme	Scheme set up by the Countryside Commission in which land-owners are grant aided to manage their land in an environmentally sensitive manner.
Culvert	Drain or covered channel carrying water across or under a road, canal etc.
Cumecs	Cubic Metres per Second: equivalent to 86.4 thousand cubic metres per day.
Cyprinid fish	Coarse fish eg.Roach, Dace and Bream.
Dangerous Substances	Substances defined by the European Commission as in need of special control. This is because they are toxic, accumulate and concentrate in plants and animals, or do not easily break down into less dangerous substances. They are classified as List I or List II.
Demand Management	Activities to manage the amount of water required from a source of supply; includes measures to control waste and/or to discourage use.
Derogate	Loss or impairment of a water resource, action causing such loss or impairment.
Derogation	A legal term that describes a diminution of the water rights of existing water users due to a new abstraction.
Determinand	A general name for a characteristic aspect of water quality. Usually a feature which can be described numerically as a result of scientific measurement.
Diffuse Pollution	Pollution without a single point source eg. acid rain, pesticides, urban run-off etc.
Diffuse Source	Pollution from non-point sources.
Dioxins	A group of 210 closely related chemicals which can be formed as by-products in some chemical processes and in various combustion processes such as waste incineration and coal burning.
Dissolved Oxygen (DO)	The amount of oxygen dissolved in water. Oxygen is vital for life so this measurement is an important, but highly variable, indicator of the 'health' of the water. It is used to classify waters.
District Local Plans	Statutory documents produced by District or Borough Councils to implement the development strategy set out in County Structure Plans. Specific land use allocations are identified.
EU Directive	A type of legislation issued by the European Union which is binding on Member States in terms of the results to be achieved but which leaves to Member States the choice of methods.
EC Regulation	European Community legislation having legal force in all member states.
Ecology	The study of relationships between an organism and its environment.
Ecological Quality Index	This describes how close biological quality is to expectations. An index of 1.0 indicates that the animals are unaffected by adverse conditions.

Ecosystem	A functioning, interacting system composed of one or more living organisms and their effective environment, in biological, chemical and physical sense.
Effective Rainfall	Total rainfall minus direct evaporation and the water used by plants for transpiration. This is equivalent to the total resource of a catchment.
Effluent	Liquid waste from Industry, agriculture or sewage treatment plants.
Enmain	Procedure in which the NRA assumes powers to maintain a watercourse.
Environmental Quality Standard (EQS)	The concentration of a substance which must not be exceeded if a specific use of the aquatic environment is to be maintained.
Environmentally Sensitive Area (ESA)	An area where traditional farming methods may be supported by grant aid from the Ministry of Agriculture, Fisheries and Food (MAFF) to support distinctive landscape, wildlife habitats or historic features.
Eutrophic	A description of water which is rich in nutrients. At worst, such waters are sometimes beset with unsightly growths of algae.
Fauna	Animal life.
Fish Biomass	A measure of the quality of a fishery as found in terms of surveys, weight by area ie g/m^2.
Flood Defences	Anything natural or artificial that protects against flooding, to a designed return period.
Flood Plain	This includes all land adjacent to a watercourse over which water flows or would flow but for flood defences in times of flood.
Flora	Plant life.
Fluvial	Relating to the freshwater river.
Forestry Authority (FA)	Advisory and Regulatory arm of the Forestry Commission.
Gauging Station	A site where the flow of a river is measured.
General Quality Assessment (GQA)	A new scheme replacing the NWC Classification system. It provides a means of assessing and reporting environmental water quality in a nationally consistent and objective way. The chemical grades for rivers introduced in 1994 uses BOD, Ammonia and Dissolved Oxygen limits for water quality between A (Good) and F (Bad). Other grades for estuarine and coastal waters are being developed and aesthetic components will be measured and graded by a system under trial now.
Geomorphology	Scientific study of land forms and of the processes that formed them.
Glacial Deposits	Term used to describe all unconsolidated superficial deposits overlying solid rock left by glacial activity.
Global Warming	The increase in the average temperature of the earth, thought to be caused by the build up of greenhouse gases.
Geomorphology	Topographical/physical features of the earth's surface.
Gravity outfall	Discharge through a pipe or sluice with no pumping.
Groundwater	Water which saturates a porous soil or rock substratum (or aquifer). Water held in storage below ground level.
Groundwater Protection Policy	NRA policy which controls activities having the potential to pollute ground water resources.
Habitat	The customary and characteristic dwelling place of a species or community.
Heavy Metals	A loose term covering potentially toxic metals used in industrial processes.

Hectare	Unit of area 100m x 100m, equal to 2.471 acres.
Herbicide	Substance used to control weeds.
Highland Carrier	An embanked watercourse carrying waters, which originate in upland areas, across low lying land before discharging to the sea.
House Equivalents	System by which areas of land and property are allocated a value in terms of numbers of houses.
Hydrogeology	Branch of geology concerned with water within the Earth's crust.
Hydrology	The study of water on and below the earths surface.
Hydrometric	The measurement of water.
Impounded	The holding back of water behind a dam. Strictly a structure which raises water levels above their "normal" height. May need a licence and/or Land Drainage Consent from the NRA.
In river needs	The totality of requirements for the water environment and effluent dilution before abstraction is taken into account.
Insecticide	Substances used to destroy or repel insects.
Integrated Pollution Control	An approach to pollution control in the UK which recognises the need to look at the environment as a whole, so that solutions to particular pollution problems take account of potential effects upon all enviornmental media.
Internal Drainage Boards (IDBs)	Authorities responsible for dealing with land drainage within a district. They are primarily concerned with agricultural land drainage but also may be involved with water supply to their district for agricultural purposes.
IPC Authorisation	An authorisation issued by Her Majesty's Inspectorate of Pollution prescribed by the Environmental Protection Act 1990 covering certain operation of processes .
Landfill	Site used for waste disposal into/onto land.
Leachate	Liquor formed by the act of leaching.
Lincoln Quality Index (LQI)	Water Quality Index derives from BMWP Score, taking habitat into account and facilitating targeting.
Lindane	An organochlorine insecticide (1,2,3,4,5,6-hexachlorocyclohexane, also know as Gamma-HCH).
Macroinvertebrate	Animals without backbones eg leeches, snails worms, insects.
Macrophytes	Any plant observed by the naked eye and nearly always identifiable. This definition includes all higher aquatic plants, vascular cryptograms and bryophytes, together with groups of algae which can be seen to be composed predominantly of a single species.
Magrophytes	Large plants. In the water environment eg reeds.
Main River	The watercourse shown on the statutory 'Main River maps' held by NRA and MAFF. The NRA has permissive powers to carry out works of maintenance and improvement on these rivers.
Managed Retreat	The deliberate abandoning of an existing tidal defence in order to obtain economic and ecological advantage. A new defence may be constructed landward of the old line.
mAOD	A measure of altitude. Metres above ordnance datum.
Microbiology	The study of micro-organisms (eg bacteria, viruses).
Minimum Acceptable Flow (MAF)	The minimum acceptable flow as defined in Section 21 of the Water Resources Act

	1991.
Minimum Residual Flow (MRF)	Target flow set locally and not legally defined.
Mitigation	Refers to the environmental impact of scheme development or operation and the actions which may be taken to reduce or ameliorate such impacts.
Morphology	The form of the structure of plants and animals.
Nitrate Sensitive Areas (NSA)	An area where nitrate concentrations in sources of public drinking water exceed, or are at risk of exceeding the limit of 50 mg/l laid down in the 1980 EC Drinking Water Directive, and where voluntary, compensated agricultural measures were introduced in 1990 as a means of reducing those levels.
Nitrate Vulnerable Zone (NVZ)	An area where nitrate concentrations in sources of public drinking water exceed, or are at risk of exceeding the limit of 50 mg/l laid down in the 1991 EC Nitrate Directive, and where compulsary, un-compensated agricultural measures will be introduced from 1996 as a means of reducing those levels.
Nutrient	Substance providing nourishment for plants and animals eg nitrogen, phosphorus.
OFWAT	Office of Water Industry's Financial Regulator of Water Service Companies .
Organic	Generally any substance containing carbon as part of its chemical make-up.
Outfall	The point at which a river discharges to a downstream source eg estuary, sea; it may also include an outfall structure to prevent sea waters backing up the system.
Oxidation	Usually a chemical reaction with oxygen, producing oxides.
Oxide	Any compound of oxygen with another element.
PARCOM	Paris Commission - is involved in monitoring nutrient in the North Sea.
Perennial Flow	River flow present through the entire year.
Permeability	The ease at which liquids (or gases) can pass through rocks or a layer of soil.
Permissive powers	Powers which confer on the NRA the right to do things but not the duty to do them.
Pesticides	Substances used to kill pests, weeds, insects, fungi, rodents etc.
pH	Quantitative expression of acidity or alkalinity of a solution.
Phenols	A class of aromatic compounds with one or more hydroxyl (-OH) groups directly attached to the benzene nucleus.
Photosynthesis	Process in which energy of sunlight is used by green plants to build up complex substances from Carbon Dioxide and water with the release of Oxygen.
Piezometers	An observation well designed to measure the elevation of the water-table at a particular level.
Potable Water	Water of a suitable quality for drinking.
Public Water Supply	The supply of water by companies appointed as Water Undertakers by the Secretary of State for the Environment under the Water Industry Act 1991.
RAMSAR	Wetland site of International Importance that is designated under the Ramsar* convention (*a town in Iran where the international convention originally agreed in 1975 to stem the progressive encroachment on, and loss of, wetland).
Raw Water Transfer	The transfer of water from one resource to another in order to meet or anticipate demand. It is usually part of a scheme such as a reservoir or pipeline.
Reach	A length of a river.
Recharge	Water which percolates downwards from the surface into groundwater aquifers.

Red List Substance	Substance which has been selected for monitoring on the basis of its persistency toxicity and ability to bioaccumulate.
Regulated River	A river where the flow is augmented through the addition of water from another source.
Return Period	Refers to the frequency of a rainfall or flooding event. Flood events are described in terms of the frequency at which, on average, a certain severity of flow is exceeded. This frequency is usually expressed as a return period in years, eg. 1 in 50 years.
Riffle	A shallow area in a river where the substrate is composed of gravel and the flow is faster.
Riparian	Of, or on, land contiguous to the river.
Riparian Owner	Owner of riverbank and/or land adjacent to a river. Normally owns riverbed and rights to midline of channel.
River Corridor	The continuous area of river, river banks and immediately adjacent land alongside a river and its tributaries.
River Flow Objectives (RFO)	A series of flows which aim to reflect the varying in river needs and the seasonality of flow patterns.
River Habitat Survey (RHS)	An inventory survey of physical features of the river and adjacent habitat.
River Needs Consents (RNC)	Permissions for discharge of effluents, that often specify limits for certain potential pollutants and ensure that the discharge does not derogate any of the uses of the controlled water.
River Quality Objectives (RQO)	The level of water quality that a river should achieve, in order to be suitable for its agreed use. Is being replaced by Water Quality Objectives (WQO's).
Rivers Environmental Database (REDS)	Comprehensive database based on 500m stretch surveys of statutory main river. It maps the physical and environmental information and provides a basic conservation resource.
Saline Intrusion	Salt water is heavier than freshwater and will therefore tend to sink to the bottom of a watercourse. Once salt water has entered a watercourse it is difficult to remove other than by flushing with high flows during floods. It can have profound effects on the ecology of a river.
Saline Waters	Water containing salts.
Salmonid Fish	Game fish eg. trout and salmon.
Scheduled Ancient Monument (SAM)	The key sites nationally for archaeology, designated by the Secretary of State for National Heritage, through English Heritage.
Sea Defences	Anything natural or artificial that prevents ingress of land by the sea.
Sea Level	As defined by Newlyn. Ground levels are measured as above Ordnance Datum Newlyn (AODN).
Set-Aside	The EC set-aside scheme was first introduced for the crop year 1991/92 as part of the Common Agricultural Policy reform to allow farmers to remove land from production by receiving compensation. Eligible crops are a wide range of arable crops, principally cereals.
Sewage	Liquid waste from cities, towns and villages which is normally collected and conveyed in sewers for treatment and/or discharge to the environment.
Sewerage	System of sewers usually used to transport sewage to a sewage treatment works.
Silage	A winter feed for cattle. Silage is produced throughout the summer by bacterial action on freshly cut grass or other crops stored in silos.

Siltation	At low velocities water will deposit the material being carried in suspension. The slower the velocity the finer the material deposited. A deposit of clays and silt is very difficult to remove naturally as it requires turbulent and high velocities.
Site of Special Scientific Interest (SSSI)	A site given a statutory designation by English Nature or the Countryside Council for Wales because it is particularly important, on account of its nature conservation value.
Sludge	The accumulation of solids from treatment processes. Sludge can be incinerated or spread on farm land.
Slurry	Animal waste in liquid form.
Soakaway	System for allowing water or effluent to soak into ground, commonly used in conjunction with septic tanks.
Source Protection Zones	A Source Protection Zone (SPZ) is the area over which recharge is captured by an abstraction borehole. SPZs are designated by the NRA and are delineated to protect potable water supplies against the polluting effects of human activity.
Sourceworks	Works whereby water may be withdrawn from a water resource.
Spate	A sudden increase in water quantity, such as a flood, causing a river to be in a swollen fast-flowing condition.
Special Protection Area (SPA)	Statutory protected habitats for wild birds under EC Regulations.
Spray Irrigation	The watering of crops by spraying. Can have a high impact on water resources.
Springs	Natural emergence of groundwater at the surface.
Statutory Consultee	In both the NRA's and other agencies' legislation there are requirements for consultation. Comments and objections which are received are noted but do not usually have the power to, in themselves, prevent the controlling authority from making a decision. An exception to this is where the NRA us a Statutory Consultee for IPC where the NRAs requirements would be taken as the minimal acceptable.
Statutory Powers	Powers conferred (eg on the NRA) where it has a duty to do things.
Statutory Water Quality Objectives (SWQO)	Methods of classifying waters and targets for individual waters that have been given statutory force through the issue of Regulations by the Secretary of State under the Water Resources Act 1991.
Storm Sewage Discharges	The discharge of untreated sewage in times of heavy rainfall and high flows .
Storm Tide Warning Service	Funded by the Ministry of Agriculture Fisheries and Food, a branch of the Meteorological Office with particular responsibility for predicting the size and warning of tidal surges.
Strata	A term applied to rocks that form layers or beds. Can also be applied to successive layers of any deposited substance eg. atmosphere, biological tissue.
Substrate	The base material, usually a rock or deposit, upon which a habitat is formed.
Subtidal	The area which is below low water mark which is covered by water.
Surface Water	Water collecting on and running off the surface of the ground.
Sustainable Development	Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.
Sustainable Management	The interpretation of the principles of sustainable development at a local/regional level within the boundaries of national and international political, economic and environmental decisions.
S105 Surveys	Section 105 of the Water Resources Act 1991 allows for Standards of Service, Assets and Flood Risk Surveys.

Taxa	Groups of similarly classified animals and plants.
Telemetry	A means of directly collecting data from remote sites.
Tide Lock Periods	Periods when freshwater cannot leave a river system as the outfall structure, usually a flap, is closed by the pressure of the high tide against it. This corresponds with high tide sea levels being higher than the river water level.
Topography	Physical features of a geographical area.
Trade Effluent	Effluent derived from a commercial process/premises.
Transpiration	Loss of water through evaporation by plants.
Washlands	Extensive semi-natural area of flood plain adjacent to a river, where water is stored in time of flood. Structures can be added to control the amount of water stored in the washland and time its release to alleviate peak flood flows in areas downstream.
Watercourse	A stream, river, canal or channel along which water flows.
Water Quality Objectives (WQO)	Water quality targets to secure specific formal minimum quality standards for specific stretches of water by given dates. A new component of these is introduced by "The Surface Waters (River Ecosystem Classification) Regulations 1994"; a classification scheme to be applied by NRA to the rivers and watercourses of England and Wales. Other existing standards operate already to give effect to various EC Directives for water quality.
Water Resource	The naturally replenished flow of recharge of water in rivers or aquifers.
Water Table	Top surface of the saturated zone within the aquifer.
Water Transfer Scheme	An infrastructure provided to transfer water from one river system to another.
Weir	A dam built across a river to raise upstream levels.
Wetland	An area of low lying land where the water table is at or near the surface for most of the time, leading to characteristic habitats.
Winter Storage Reservoir	Reservoirs built by farmers to store water during the winter months when it is "plentiful" for re-use during the summer.
Yield	The reliable rate at which water can be drawn from a water resource.
Zooplankton	Animal organisms consisting mainly of small crustaceans and fish larvae. the animal constituent of plankton.
1:10 Year Drought/Flood	A drought/flood event with a statistical probability of occurring once in a ten year period (other periods may be specified in a similar way).
95%ile Limit	A numerical limit, specified in a discharge consent, which must be achieved or bettered for at least 95% of a specified time period.

The National Rivers Authority

Guardians of the Water Environment

The National Rivers Authority is responsible for a wide range of regulatory and statutory duties connected with the water environment.

Created in 1989 under the Water Act it comprises a national policy body coordinating the activities of 8 regional groups.

The main functions of the NRA are:

Water resources	—	The planning of resources to meet the water needs of the country; licensing companies, organisations and individuals to abstract water; and monitoring the licences.
Environmental quality and Pollution Control	—	maintaining and improving water quality in rivers, estuaries and coastal seas; granting consents for discharges to the water environment; monitoring water quality; pollution control.
Flood defence	—	the general supervision of flood defences; the carrying out of works on main rivers; sea defences.
Fisheries	—	the maintenance, improvement and development of fisheries in inland waters including licensing, re-stocking and enforcement functions.
Conservation	—	furthering the conservation of the water environment and protecting its amenity.
Navigation and Recreation	—	navigation responsibilities in three regions — Anglian, Southern and Thames and the provision and maintenance of recreational facilities on rivers and waters under its control.

The National Rivers Authority will form part of a new organisation which will have responsibilities for the environmental protection of water, land and air. The new Environment Agency starts its work of managing the environment in England and Wales on 1 April 1996.

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