



local environment agency plan

WITHAM

LEAP

JULY 2000



ENVIRONMENT AGENCY

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**ENVIRONMENT
AGENCY**

KEY FACTS AND STATISTICS

Total Area: 3,224 km²

Population: 347673

Environment Agency Offices:

Anglian Region (Northern Area)
Waterside House, Lincoln
Tel: (01522) 513100

Lincolnshire Sub-Office
Manby
Tel: (01507) 328102

County Councils: Lincolnshire, Nottinghamshire, Leicestershire

District Councils: West Lindsey, East Lindsey, North Kesteven, South Kesteven, South Holland, Newark & Sherwood

Borough Councils: Boston, Melton

Unitary Authorities: Rutland

Water Utility Companies: Anglian Water Services Ltd, Severn Trent Water Ltd

Internal Drainage Boards: Upper Witham, Witham First, Witham Third, Witham Fourth, Black Sluice, Skegness

Navigation Authorities: British Waterways (R.Witham) 65.4 km Port of Boston (Witham Haven) 10.6 km

Length of Statutory Main River: 633 km

Length of Tidal Defences: 22 km

Length of Sea Defences: 20 km

Length of Coarse Fishery: 374 km

Length of Trout Fishery: 34 km

Water Quality:

Biological Quality Grades 1999

Grade	Length of River (km)
"Very Good"	118.5
"Good"	165.9
"Fairly Good"	106.2
"Fair"	8.4
"Poor"	0
"Bad"	0

Chemical Quality Grades 1999

Grade	Length of River (km)
"Very Good"	11
"Good"	111.6
"Fairly Good"	142.8
"Fair"	83.2
"Poor"	50.4
"Bad"	0

Major Sewage Treatment Works: Lincoln, North Hykeham, Marston, Anwick, Boston, Sleaford

Integrated Pollution Control Authorisation Sites: 14

Sites of Special Scientific Interest: 39

Sites of Nature Conservation Interest: 154

Nature Reserves: 12

Archaeological Sites: 199

Licensed Waste Management Facilities:

Landfill: 30

Metal Recycling Facilities: 16

Storage and Transfer Facilities: 35

Pet Crematoriums: 2

Boreholes: 1

Mobile Plants: 1

Water Resources:

Mean Annual Rainfall:

596.7 mm

Total Gross Licensed Abstraction:

111,507 ml/yr

% Licensed from Groundwater = 32 %

% Licensed from Surface Water = 68 %

Total Gross Licensed Abstraction:

Total no. of Licences in the Plan Area:

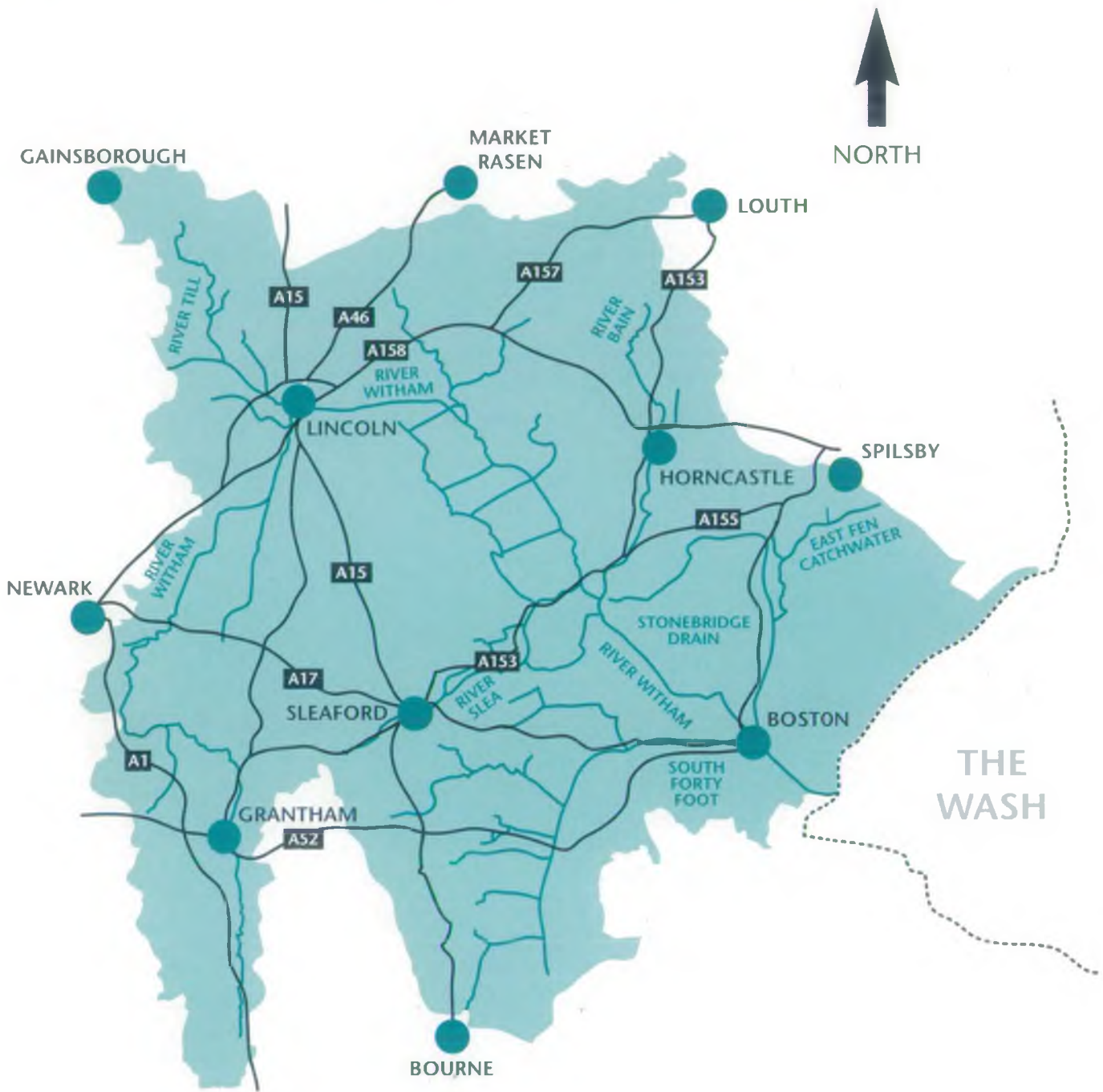
723






No. of Surface Water = 402

No. of Groundwater = 281

No. of Impounding = 40

PLAN AREA



-  Plan Area
-  Principal Roads
-  Main River
-  Railway
-  Urban Area

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FOREWORD

The Environment Agency was established to protect, monitor and improve the environment in its broadest sense – ultimately contributing to the worldwide goal of sustainable development. We have become one of the most powerful environmental regulators in the world. By exerting our influence on the regulation of air, land and water, we have a unique opportunity to look at our environment in an integrated and holistic manner.

Local Environment Agency Plans (LEAPs) set out a vision for the quality of the environment in a particular area and how that may be achieved through appropriate management. The Plans focus particularly on issues that have been raised through our consultation with the local communities affected. Many of these issues and other opportunities for improvement cannot be tackled by the Agency alone, so the Plan also acts as a platform for partnership with other interested parties.

Whilst the Vision, by its very nature, is not constrained by the practicalities of budgets and resources, the Activity Plans set out our firm proposals for the delivery of real improvements to the local environment – as steps towards achieving that Vision. Consequently, LEAPs are becoming one of the cornerstones to how the Agency plans its business.

We hope that you will find this document useful and informative. Readers' opinions and suggestions are, as always, welcomed. We look forward to working with you to make this Plan a reality.



Ron Linfield
Northern Area Manager

ENVIRONMENT AGENCY



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This book is due for return on or before the last date shown below.

~~7/11/03~~

CONTENTS

Page No

Foreword	
Key Details and Plan area	
Contents	5
Vision	6
1.0 The Environment Agency	7
1.1 Local Environment Agency Plans	8
1.2 The Consultation Process	8
2.0 The Witham LEAP Area	10
2.1 Overview	10
2.2 Water Resources	12
2.3 Biodiversity	12
2.4 Water Quality	12
2.5 Flood Defence	12
2.6 Waste Management	13
2.7 Air Quality	13
3.0 Activity Plans	14
3.1 LEAP Issues	15
3.2 Wash LEAP Issues	56
4.0 A Better Environment Through Partnership	58
4.1 Introduction	58
4.2 Environmental Influences	58
5.0 Future Review and Monitoring	63
Appendices:	
1 Duties, Powers and Interests of the Environment Agency	65
2 The Routine Work of the Environment Agency	70
3 Lincolnshire Area Environment Group (AEG) Members	71
4 Organisations and Individuals Who Commented on the Draft LEAP	72
5 EC Directives	73
Glossary	75

VISION

The Witham LEAP provides a position statement on the current state of the area's environment, and describes the major issues which affect its environmental, economic and social wellbeing.

Our aim is to see the Witham LEAP area's valuable environmental assets protected from the pressures of human activity. Within the next ten to fifteen years we aim to further protect and enhance this local environment, adding to the quality of life for present and future generations. The LEAP provides the opportunity to demonstrate that environment protection and improvement need not compromise wealth generation, and can bring social improvements which significantly enhance our quality of life.

To achieve this objective we will operate openly and in consultation with local communities, developing strong partnerships with the common goal of protecting and developing the Witham catchment for this and future generations.

More specifically, we aim to:

- maintain and enhance the area's conservation value through initiatives such as Biodiversity Action Plans (BAPs);
- promote the recreational value of the Plan area without compromising the needs of the environment;
- manage the water resources of the limestone aquifer and Rivers Witham, Till, Sleas, Bain and Waring;
- maintain and improve water quality;
- maintain high standards of flood defences and, where necessary, improve the level of protection for people and property;
- promote and maintain a healthy fish population; and
- prevent and reduce emissions to air, water and land from potentially polluting installations.

1.0 THE ENVIRONMENT AGENCY

Our aims are:

- to achieve major and continuous improvements in the quality of air, land and water;
- to encourage the conservation of natural resources, animals and plants;
- to make the most of pollution control and river-basin management;
- to provide effective defence and warning systems to protect people and property against flooding from rivers and the sea;
- to reduce the amount of waste by encouraging people to re-use and recycle their waste
- to improve standards of waste disposal;
- to manage water resources to achieve the proper balance between the country's needs and the environment;
- to work with other organisations to reclaim contaminated land;
- to improve and develop salmon and freshwater fisheries;
- to conserve and improve river navigation;
- to tell people about environmental issues by educating and informing; and
- to set priorities and work out solutions that society can afford.

We will do this by:

- being open and consulting others about our work;
- basing our decisions around sound science and research;
- valuing and developing our employees; and
- being efficient and businesslike in all we do.

We are committed to being an open organisation. We provide information about our decisions and actions and ensure consultation for our customers on plans and reports. Our Customer Charter sets out how we aim to achieve this commitment. We maintain a set of public registers which hold information on the activities we regulate and the monitoring we carry out. In addition to this, we make available most other environmental information that we hold.

We have produced a guide to information available to the public, which sets out what information is accessible and how to obtain it. Information is often provided free of charge, but for large and complex requests we may charge for staff time and materials. Confidential information, incomplete reports and information where disclosure may lead to environmental damage is generally not available. Some environmental details and information about our public registers are available on the internet at <http://www.environment-agency.gov.uk>.

The Environment Agency has a wide range of duties and powers relating to different aspects of environmental management. These, together with those areas in which we have an interest, but no powers, are described in Appendices 1 and 2. We are required and guided by Government to use these duties and powers in order to help achieve the objective of sustainable development. The Brundtland Commission defined sustainable development as "*development that meets the needs of the present without compromising the ability of future generations to meet their own needs*".

At the heart of sustainable development lies the integration of human and environmental needs- the creation of the Agency itself was in part a recognition of the need to take a more integrated and longer-term view of environmental management at a national level. We aim to reflect this in the way we work and in the decisions we make.

Taking a long-term perspective requires us to anticipate risks and encourage precaution, particularly where environmental impacts may be long-term or irreversible. We must also educate and inform society as a whole, as well as carry out our prevention and enforcement activities, in order to ensure continuing protection and enhancement of the environment. One of the key outcomes of the United Nations Rio "Earth Summit" in 1992 was agreement by governments that, in order to solve global environmental problems, local action is crucial: we must **think globally but act locally**.

1.0 THE ENVIRONMENT AGENCY

1.1 Local Environment Agency Plans

We are committed to a programme of Local Environment Agency Plans (LEAPs) - local agendas of integrated action for environmental improvement. LEAPs help us to identify, assess, prioritise and solve local environmental issues related to our functions, taking into account the views of our local customers. This allows us to deploy our resources to best effect, thus optimising local environmental benefits.

This LEAP combines and replaces the Lower Witham Catchment Management Plan and the Upper Witham LEAP, produced in 1996 and 1997 respectively.

The LEAP process involves a number of stages:

i) LEAP Draft Action Plan

The publication of the Witham Draft LEAP (September 1999) marked the start of a three month period of formal consultation enabling external organisations and the general public to work with us in planning the future of the local environment (Section 1.2).

ii) LEAP

This LEAP, which takes into account the views expressed during the consultation process, is a 5 year plan identifying actions, costs and timescales for both the Agency and its partners to resolve the identified issues. Where appropriate, agreed actions are incorporated into the Agency's annual Business Plan.

iii) Annual Review

We monitor the actions undertaken throughout the year and will report on progress in Annual Reviews. These will also identify additional actions needed to maintain progress in the light of any changes in the LEAP area, and remove or amend actions where they are no longer appropriate.

1.2 The consultation process

We have undertaken rigorous consultation in the development of the Witham LEAP:

A pre-consultation meeting was held with a number of key organisations, as well as our customer consultative group - the Lincolnshire Area Environment Group (AEG) - so that their views could be taken into consideration at an early stage.

Copies of the Draft LEAP, published in September 1999, were sent to a range of organisations and individuals, including representatives of industry, local authorities, environmental groups, sport and recreational groups and any other local groups with an interest in the Plan area. They were invited to comment on the Draft LEAP, expressing their views on the issues and options, and on how the development of strategies and plans should be progressed. A Draft LEAP was also sent to all parish councils in the area.

Two public meetings, held at Lincoln Council Chambers on November 4th 1999 and at the Assembly Rooms in Boston on November 8th 1999, allowed representatives from industry, local authorities, parish councils, environmental groups, recreational groups and other local interest groups to discuss the Plan in more depth.

Results of the consultation

Comments were received from 27 organisations and individuals (Appendix 4). These have been summarised in a 'Statement of Consultation' which has already been sent to respondees and key partners.

The comments received were generally supportive of the LEAP. We received several helpful suggestions and were asked a number of questions about the Plan area. All comments were thoroughly discussed and where appropriate these are reflected in the LEAP. Key points raised by the consultation period included concerns over:

● **the sustainability of navigation on the Sleas and Bain**

Several organisations are working in partnership with the aim of returning these watercourses to navigation. We welcome proposals to increase navigation in the catchment, but we also need to consider the possible implications of future drought conditions or other variations in water supply. We are also working to ensure that any future flood defence works do not compromise these navigations.

1.0 THE ENVIRONMENT AGENCY

● pollution by aviation fuel at RAF Waddington

RAF Waddington, the source of an aviation fuel leak, is situated above a major aquifer. The Agency's priority throughout this incident has been the satisfactory clean-up of the contaminated aquifer. We will continue to liaise with the RAF on this matter, and to work to protect groundwater resources in general, taking stringent measures where necessary

● targets for flood defence and warning standards

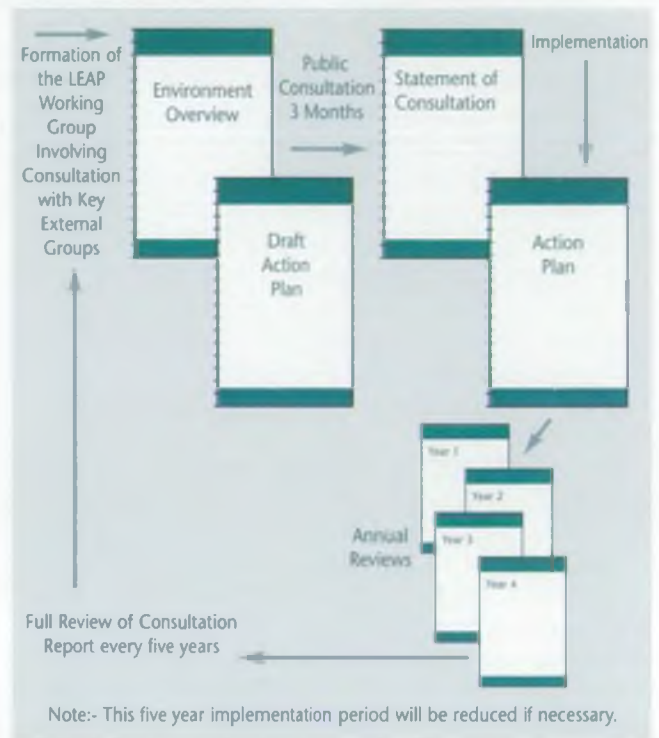
We take great care in scheduling our flood defence works, ensuring that all works are cost beneficial and address the most serious flood defence problems as a matter of priority. Works in this area are also currently being undertaken as part of the Lower Witham Flood Relief Strategy. We are also improving our ability to meet our flood warning target time of 2 hours, for example by updating and expanding the Anglian Region Telemetry System (ARTS).

In addition, several organisations expressed a wish to increase their partnership with the Agency, including West Lindsey District Council, Rippingale Parish Council, Inland Waterways Association, National Farmer's Union, and the Hawk and Owl Trust. These opportunities for greater partnership are welcomed.

The responses to the Draft LEAP have been of great value in the development of this LEAP, and many of the actions and issues involved have been amended as a direct result of the consultation process. It is hoped that the resulting proposals identify the appropriate actions to resolve many of the issues, setting them into a five-year timetable. Progress will be monitored and reported on through Annual Reviews.

We recognise the links between this LEAP and adjacent plans, and will work to ensure that they are compatible. Local Environment Agency Plans have been produced for the adjacent Welland (January 1998), Wash (March 1998), Louth Coastal (October 1998) and Grimsby/Ancholme (April 2000) LEAP areas.

The LEAP Process



LEAP Team

Roger Ashford	Project Leader
Richard Kisby	Development Planning and LEAPs
Debbie Rosen	LEAPs Officer
Dave Hendrikz	Water Resources
Martin Shilling	Flood Defence
Phil Smith	Fisheries, Ecology and Recreation
Rob Stevens	Environment Protection
John Giles	Environment Protection

2.0 THE WITHAM LEAP AREA

2.1 Overview

The Witham LEAP area encompasses the catchment of the River Till, which rises near Gainsborough; that of the Bain, rising between Louth and Market Rasen; the Sleas, rising near Sleaford; and the principal watercourse of this Plan area, the River Witham, whose source is at South Witham.

The River Witham and its valley initially run northward from South Witham. The river grows and matures as it makes its way to the busy engineering town of Grantham. Wharf Road, Grantham, is a reminder that the river formed the final part of a canal to Nottingham from 1797 to 1936. This area is now the site of the Sir Isaac Newton Shopping Centre, built in 1983 to commemorate the former pupil of Kings School, Grantham. From here, the Witham makes its way through fertile ground to Lincoln, where it discharges into the Brayford Pool (an inland port excavated by the Romans from a natural lake which formed thousands of years ago) before moving through the city. It then runs south-east to the fens and Boston.

Navigation and drainage have made a significant impact on the Plan area, especially the Fossdyke Canal, Britain's oldest canal still in use. The length between Torksey and Odder was built by the Romans, probably primarily for drainage but with the advantage of navigation. It linked Lincoln to the River Trent, possibly as part of a route to York. Between Torksey Lock and Saxilby the Canal is quiet and remote, running between grassed flood banks. The remainder of the route between Odder and Lincoln is really the straightened course of the River Till.

Like the River Witham, the Fossdyke Canal enters the Brayford Pool at Lincoln. In Viking times, this area received goods from Scandinavia and Europe. Later, the Normans landed stone to build the cathedral and castle, and the medieval port made Lincoln a main centre for the wool trade. The waterfront has always been an important feature in Lincoln's history and is now being revitalised by the University of Lincolnshire and associated developments. Downstream from here is the Glory Hole or High Bridge, the oldest bridge in this country with buildings still upon it, whose Norman barrel-vaulted span caused navigational problems



Fossdyke Canal at Torksey

2.0 THE WITHAM LEAP AREA

for centuries. Lincoln Corporation, through the suggestions of William Jessop, eventually altered High Bridge in 1795 to give more depth of water for laden boats. Some of the costs were paid by the proprietors of the Slea Navigation and the Horncastle Canal.

Lincoln is strongly associated with the medieval era through its magnificent cathedral (constructed from local limestone and purbeck marble) as well as with the more recent past as the city which produced the first military tank. Today Lincoln's economy is boosted by light engineering and service based industries. It boasts a busy and prosperous shopping centre and various retail parks on the outskirts of the city.

Downstream of Stamp End Lock, the waterway goes through a short industrial area before returning to open countryside. From here it moves into a man-made section of the River Witham with engineered flood banks, paralleled by the North and South Delph watercourses. Below Bardney Lock a loop of the river's old course flows back in, carrying water from the North Delph and the Barlings Eau.

From Bardney Lock to Southrey, rich arable land unfolds from the south bank with woodland just to the north. The dismantled Great Northern Railway follows the north bank between Bardney and Boston. Between Southrey and Kirkstead Bridge there is quiet farmland with scattered villages, whilst to the south and west there are vast, remote and fertile drained fens. Woodhall Spa, a small town owing its existence to the discovery of natural mineral water in the early 19th Century, lies to the north-east.

The Witham then flows from Kirkstead Bridge, where the Timberland Delph enters the river, to Tattershall Bridge, upstream of which Billingham Skirth also comes in. The river continues past Dogdyke Pumping Station, and just upstream of Dogdyke the River Bain from Horncastle discharges to the Witham. The River Bain was successfully navigable to Horncastle by 1802, but from 1855 railway competition reduced trade on the canal. Trade was virtually nil by 1878, and the canal was abandoned in 1889 although much of the original channel remains. The River Slea, which rises at springs known as Boiling Wells upstream of Sleaford, then comes into the Witham downstream at Chapel Hill. During the nineteenth century, Sleaford grew as a commercial centre with the River Slea powering eighteen mills. Two cargoes dominated the Slea. Corn and milled grain were exported from the area, whilst coal from Yorkshire and Derbyshire was imported. The Slea was most

prosperous in the 1840s but the increase in rail travel meant that boat traffic decreased. The Slea Navigation Company had ceased to exist by 1881, although the lower reaches of the navigation were kept open until the 1930s. The Slea Navigation Society, formed in 1977, aims to return this waterway to navigation. Similar possibilities have been proposed for the South Forty Foot Drain and Horncastle Canal, although they are at an earlier stage, whilst the Witham Navigable Drains are also being promoted for further recreational development.

From Chapel Hill the Witham makes its way to Langrick Bridge and Boston, the capital of the Lincolnshire Fens. The south bank is lined with houses whilst the town centre is confined to the north bank. A short distance downstream of the Grand Sluice is the famous "Stump" of St Botolph's – the largest parish church in England. The tower is 272ft high, providing panoramic views of Lincolnshire and the Wash.

Downstream of the Grand Sluice, the Witham forms the tidal link to the Wash Estuary. The South Forty Foot Drain, Maud Foster Drain and Hobhole Drain enter at various points prior to discharge into the Wash. Under normal flow conditions, the South Forty Foot Drain discharges through gravity outfall sluices. However, in times of very heavy flow, Black Sluice Pumping Station discharges water during high tide when gravity discharge is not possible. The Hobhole also discharges by gravity during normal flow conditions with pumped discharge . during high flows, whilst the Maud Foster is a gravity system.

The Witham Catchment contains a large percentage of high quality agricultural land, with grade 1 land lying along the coast and around Boston. The area is dominated by cereals and general cropping, however, small areas are used for livestock rearing. Further inland, the grade 2 quality land lies in a band following the coastline. These silt and peat soils around the Wash are capable of growing the widest range of crops and are particularly good for horticulture. With increasing distance from the Wash, land quality becomes grade 3, interspersed with grade 2 on the free draining lighter calcareous soils of the Lincolnshire Wolds and Edge. Poorer quality land exists where soils are heavier and poorly drained, such as on the boulder clays and soils adjoining the river. These soils are alluvial and are normally associated with wet meadowland and pastures which support a variety of plants and wildlife. Drainage and changes in management regimes threaten these landscapes, so their water levels must be carefully monitored and maintained.

2.0 THE WITHAM LEAP AREA

2.2 Water resources

The principal natural water resources in the Plan area are the Lincolnshire Limestone Aquifer and the River Witham. Water from the limestone aquifer is used for public, agricultural and industrial supply. This resource is fully committed and no additional water is available for abstraction. The River Witham is another valuable source of both public and agricultural water. Farmers use this resource through winter abstraction and storage or direct summer abstraction.

Water resources benefit from the Trent Witham Ancholme (TWA) River Transfer Scheme. This is owned and operated by the Agency and forms a key infrastructure link for surface water resources and abstractions across north Lincolnshire. The scheme comprises two river transfers, one from the River Trent at Torksey to the River Witham, and one from the River Witham at Short Ferry to the River Ancholme, plus a storage reservoir at Toft Newton in the headwaters of the Ancholme catchment. The TWA scheme is key to the management of water resources, the maintenance of summer water levels and meeting agricultural abstraction demands from the River Witham.

2.3 Biodiversity

The catchment's watercourses support a wide variety of fish communities and river sections show a range of typical fish zones. The upstream headwaters contain brown trout, grayling and associated fish species. The fish assemblage alters downstream from salmonid through to flow-loving coarse fish species, and then to the typical lowland coarse fish community of the Lower River Witham which may include common bream, roach, tench and pike. Fish biomass figures demonstrate a good quality fishery, reflecting the high quality recreational resource that constitutes the River Witham today. However, some anglers believe fish numbers in this river system are dropping, and the Agency is investigating this matter.

Despite damage to much of the area's native flora and fauna over the last century, as a consequence of land drainage, urbanisation and intensive farming, many conservation assets remain, most notably in the upper reaches of the Witham and Bain. The Cringle Brook, which joins the River Witham south of Grantham, probably has the most diverse macroinvertebrate fauna in Eastern England. The upland zones of the Lower Witham (in the west and north of the Plan area) meanwhile include areas of mixed farming, including several sizeable woodlands, some of which are Sites of Special Scientific Interest (SSSIs).

In the lower-lying areas of the catchment, modifications to river and drainage systems for land drainage have resulted in degraded "in-channel" habitat and aquatic plant diversity, and the loss of natural fenland habitat. These waters are also naturally eutrophic, exerting further constraints on biodiversity which are exacerbated by low winter water levels in many watercourses.

In addition, the Plan area includes the southern tip of the Lincolnshire Wolds, an Area of Outstanding Natural Beauty. There are also 154 SSSIs in the LEAP area. We, along with other interested parties including English Nature and the relevant drainage authorities, are producing Water Level Management Plans for important water-dependent SSSIs, to ensure their future well-being. The Grantham Canal, an important wildlife corridor and biodiversity resource, is also in part an SSSI, supporting a number of Biodiversity Action Plan priority species, including grass-wrack pondweed, spined loach, water vole and otter.

2.4 Water Quality

Water quality in the Witham Catchment is generally good to fair. The uppermost reaches are generally unpolluted, but as the river flows more slowly through the fertile agricultural areas downstream of Grantham, eutrophication can reduce river quality. Major effluent inputs from urban areas such as Lincoln add to the load.

Groundwater quality is also generally good. However, again the rural nature of the area has a major influence and groundwater is highly vulnerable to pollution where the area's aquifer outcrops at the surface. The increase in fertiliser applications since the Second World War means that nitrate levels have been rising gradually, resulting in nitrate concentrations in some surface and groundwaters that exceed EC Surface Water and Nitrate Directive standards.

2.5 Flood Defence

Flood defences are vitally important for the protection of both land and people, particularly in the light of rising sea levels. Along the Lincolnshire coastline, sea levels relative to land levels are rising at an estimated 6mm per annum. The current defences at Boston provide a level of protection for a 1 in 100 year¹ tide event, with sufficient freeboard to allow for a rise in levels into the next century. However, in the early 21st Century we must consider raising the defences still higher.

¹ The flood defence standard describes the level of protection given by reference to the return frequency of a flood event which would overtop the defence. The 1:100 year standard means that the likelihood of such a flood level being exceeded has a 1% risk of occurring in any one year.

2.0 THE WITHAM LEAP AREA

Flood defence standards for lengths of the Lower Witham and its tributaries between Lincoln and Boston meanwhile fall below our target standards. Our 1997 Strategy Study recommended a level of service reaching a required minimum throughout the catchment, and a number of flood defence schemes are being pursued. Our target standards are also not currently met on the Upper Witham at Grantham and the South Forty Foot Drain, and this is also addressed in the LEAP.

2.6 Waste Management

Society exerts further pressure on the environment through the disposal of waste. The most common disposal route for waste is landfill, and this can cause harm to both the environment and human health if not managed properly. Poorly operated landfill sites can result in noise, smells, vermin and wind-blown litter. Landfilled waste can also pose a risk to both ground and surface water quality through the production of leachate, whilst methane and carbon dioxide gases are produced at the landfill sites as the waste decays.

As the regulating authority for waste management, we aim to work with the local authorities to ensure that due care is taken in the handling and disposal of waste (to both land and water). We advocate sustainable waste management and we have also developed a Groundwater Protection Policy which aims to minimise the risks to groundwater from development and change in land-use through the planning process.

Waste Minimisation

The Lincolnshire Waste Minimisation 2000 (LWM2K) initiative is a 3 year project which is now coming to its conclusion. LWM2K has been operated in partnership with Lincolnshire local authorities, the University of Lincolnshire and Humberside, Anglian Water Services Ltd and the Government's Environmental Best Practice Programme. We have part-funded the scheme, which has provided advice and training to over 50 companies across Lincolnshire, promoting environmental good practice which should also result in "bottom line" cost savings.

Companies joining the scheme have been able to attend a series of free seminars providing them with the knowledge and skills required to implement successful waste minimisation initiatives on their own premises. This has been backed up by free on-site consultancy advice by University of Lincolnshire and Humberside auditors.

The target of £250,000 savings over 3 years has been comfortably achieved and the project administrators, Business Link Lincolnshire, are currently assessing companies to establish the savings and environmental improvements successfully identified and implemented. The project steering committee is currently evaluating potential funding sources in order to allow the initiative to be continued in the future.

2.7 Air Quality

Air quality in this predominantly rural area is relatively good, and has been improving in recent years. Industrial emissions are regulated to minimise their environmental impact, but wider concerns include atmospheric ozone levels and acid rain.



Waste management at a landfill site

3.0 ACTIVITY PLANS

In September 1997, the Environment Agency produced a document entitled 'An Environmental Strategy for the Millennium and Beyond'. This was essentially based upon the need to take an integrated approach to environmental management. In producing this Plan we have used the Strategy to group the local issues and show how LEAPs integrate action for local environmental improvement.

Our principal and immediate environmental concerns in the Witham area are:

● Managing our water resources



● Enhancing biodiversity



● Managing our freshwater fisheries



● Delivering integrated river basin management



● Conserving the land



● Managing waste



● Regulating major industries



● Improving air quality



● Addressing climate change



These symbols are used throughout the LEAP to highlight the major concerns involved with each issue. Although issues are grouped under single themes, much of our work covers more than one theme and this is shown at the start of each issue.

LEAP issues and actions cut across all the areas of our work. This LEAP presents a programme of agreed actions and, where possible, gives an indication of the cost of each action to the Agency. The programme of agreed actions consists of the work we wish to undertake in the next five years, dependent on other priorities arising and funding availability. Revisions to the programme will be reported on in Annual Reviews.

3.0 ACTIVITY PLANS

3.1 LEAP ISSUES

1. Managing Our WATER RESOURCES

- 1a River flows can be reduced by licensed abstraction to levels where environmental degradation occurs.
- 1b There is concern over the sustainability of proposals to restore the Slea Navigation and Horncastle Canal for navigation purposes.

2. Enhancing BIODIVERSITY

- 2a There has been a significant reduction in the area of river and wetland habitats and associated species.
- 2b The introduction of invasive alien plant and animal species threatens local ecological diversity.

3. Managing Our FRESHWATER FISHERIES

- 3a There is local and national concern from anglers regarding the poor quality of match angling sport.
- 3b Fish populations across the River Witham catchment suffer from degraded habitat and river management practices.
- 3c The upstream and downstream free passage of fish is restricted by weirs, locks and other impoundments, which also alter the aquatic environment.

4. Delivering INTEGRATED RIVER-BASIN MANAGEMENT

- 4a The increasing demand and new opportunities for leisure activities associated with the river environment can have conflicting impacts on the natural resource and other uses.
- 4b The escape of aviation fuel into the aquifer underlying RAF Waddington continues to pose a risk to the environment.
- 4c Nitrate concentrations in some ground and surface waters exceed, or are expected to exceed, the EC Nitrate Directive limit.
- 4d Contaminated land has the potential to cause further pollution and harm to human health.
- 4e Routine chemical monitoring indicates poor water quality at a number of sites/stretches in the Plan area.
- 4f Nutrient enrichment of watercourses in the Plan area impacts on water quality and affects flora and fauna and other uses of water, such as navigation, amenity and fishing. River Ecosystem quality targets can be compromised.
- 4g Inadequate local sewerage systems in some villages result in localised pollution and may have public health implications.
- 4h Water quality in the Witham, Hobhole, Maud Foster and South Forty Foot Drains is affected by saline intrusion.

- 4i Land contaminated as a result of past industrial practices causes water quality to fail the EC Dangerous Substances Directive.

5. Conserving the LAND

- 5a The level of protection provided by, and the condition of, existing flood defences on the Witham Haven is being reduced by rising sea levels and bank erosion.
- 5b Flood defences along the Lower Witham and its tributaries do not meet target standards.
- 5c Standards of flood protection along the Upper Witham at Grantham and the South Forty Foot Drain do not meet target standards.
- 5d A potential risk to the Fosdyke canal flood defences is caused by the shared responsibility for maintaining the embanked canal.
- 5e At certain locations in the Plan area our flood warning target of two hours is not being met.
- 5f Locally, inadequately maintained riparian drainage systems give rise to land drainage problems.
- 5g There is concern that development within the catchment may be contributing to increasing flood risk in Lincoln and Grantham.

6. Managing WASTE

- 6a Storage of tyres at Normanton airfield poses a potential risk to the environment and harm to human health.

7. Addressing CLIMATE CHANGE

- 7a Methane emissions from landfill sites in the catchment harm the environment.

For each issue we have specified:

- An overall objective
- Responsible parties
- Proposed actions
- A proposed timetable
- Estimated costs (where possible). An "R" in the Costs column denotes that costs are associated with our routine work, whilst NA denotes "non-Agency", in that the costs are incurred by other parties. Please note that any costs are indicative only.

The following points should also be noted:

- Our everyday work commits substantial resources to monitoring and managing the environment. This work is explained briefly in Appendix 2.
- The issues and actions are not presented in any order of priority.

3.0 ACTIVITY PLANS

- Proposed actions have been costed where possible, however, in some cases actions are covered by routine Agency costs (R), will be incurred by other parties (NA) or are still to be established (TBE).
- Issues relating to the Wash Estuary are not duplicated in this LEAP, however, a summary of Wash LEAP issues which have implications for the Witham area can be found in Section 3.2.
- Some actions were due to be completed during or shortly after the time at which this document went to press (July 2000). These actions will be reported on in the first Annual Review of the Witham LEAP.

1 Managing Our WATER RESOURCES

Agency Operational and Strategic Actions are to:

- demand a more efficient use of water by the water companies and encourage this by industry in general through education and best practice;
- encourage a more efficient use of water by the public and a change in public attitude to water usage;
- promote "best practice" and work with others in specifying technical approaches or standard methodologies in relation to water resource issues of relevance to the Agency;
- promote the development and sale of low-water usage domestic appliances, supported by legislative changes, if necessary;
- promote reductions in leakage by the water companies before considering any cases for investment in new reservoirs and not approve the exploitation of new environmental resources until water saving measures have been introduced;
- support the imposition of compulsory selective metering where water supplies are under stress and where meters are economically sensible to install;
- support the voluntary acceptance of water meters when accompanied by other water-saving incentives for the Customer;
- vigorously apply our Groundwater Protection Policy to ensure that the quality and use of our groundwaters is improved;
- examine water transfer schemes carefully to ensure that no environmental damage would result from their introduction and most efficient operation;
- implement the current programme of alleviating low-flow rivers as quickly as possible;
- seek new legislative powers to reform the use of 'licences of right' to extract water from the environment;
- seek new powers to facilitate the inter-basin transfer of water, and for the open and transparent provision of plans and information relating to such schemes in order to broaden the public debate on these important issues;
- ensure that the practical limitations arising from water supply and treatment are fully considered by providing planning authorities with all information relevant to new housing or industrial developments;
- ensure that the UK's experience and needs are reflected in the scientific and technical discussions within the development of the EC's Water Framework Directive;
- ensure the implementation of the national environment programme which identifies sites for investigation and implement solutions where necessary, and work in partnership with the water companies and English Nature to ensure all environmental needs are taken into account;
- research into more efficient methods for the management of water, and into the potential risks for the aquatic environment arising from its mis-management.

3.0 ACTIVITY PLANS



Issue 1a River flows can be reduced by licensed abstraction to levels where environmental degradation occurs

Most abstraction licences granted today have conditions that prevent abstraction when flows or levels fall below a stated value. This is because, in the past, licences were issued with insufficient controls to adequately protect the aquatic environment (or none at all in the case of Licences of Right) in the absence of abundant water resources. In theory, some of these licences enable the whole flow of a river to be abstracted. The ecological impacts of low flow periods due to summers and droughts may be extended or exacerbated by abstraction. The concept of minimum acceptable flows² has been in water abstraction legislation for 35 years, but this has never been set under statute. A major difficulty lies in defining the instream flow requirements for flora and fauna and, to a certain extent, general amenity. Prescribed flows have been set in numerous licences but these are generally on an ad hoc and largely inconsistent basis.

Achieving the right balance between abstraction and the needs of the environment may also be hampered by a poor understanding of the relationships between river and groundwater flow, the ecological health of a river and its physical characteristics. We are addressing this issue through the development of the LIFE (Lotic-invertebrate Index for Flow Evaluation) methodology. This can show how variable flow regimes impact on a river's macroinvertebrate communities. Every invertebrate family and species has been assigned to different flow groups depending on their primary flow affiliation.

We are particularly concerned about the potential impacts of reduced flow in the Cringle Brook, a high value water environment with an extremely diverse stream fauna, including the native crayfish (*Austropotamobius pallipes*) (see Issue 2b(iii)). Discussions are presently being undertaken with Anglian Water Services Ltd (AWS), the major abstractor from Cringle brook, to agree an action plan to improve the sustainability of the watercourse.

² As defined in Section 21 of the Water Resources Act 1991.

Objective Protect downstream flow levels.										
Responsibility		Action	00/	01/	02/	03/	04/	Future	Cost (£k)	Comments
Lead	Other		01	02	03	04	05			
Agency		Impose suitable controls on new licences by investigating in-river needs.	*	*	*	*	*	*	R	We will continue to develop and apply the best available techniques.
Objective Restore a sustainable balance between river flows/levels and abstraction.										
Responsibility		Action	00/	01/	02/	03/	04/	Future	Cost (£k)	Comments
Lead	Other		01	02	03	04	05			
Agency		Develop and prioritise CAMS.	*	*	*	*	*	*	40	This process will begin in spring 2001. CAMS are likely to be developed for each LEAP area.
Agency	Abstractors	Consult with other users to formulate CAMS.	*	*	*	*	*	*	R plus consultancy costs	The CAMS will clearly spell out and consult on abstraction policy on a catchment and possibly sub-catchment basis. They are likely to include catchment conditions, the time limits to be applied to licences and river flow objectives.
Agency	EN Abstractors	Implement CAMS in reviews of abstraction licences.		*	*	*	*	*	R plus compensation costs	CAMS will be reviewed on a 6-year rolling cycle. The costs of compensation for changes to licences are still to be determined.
Agency	WRC IFE External Contractor	Apply "LIFE" methodology study when available.	*	*	*	*	*	*	TBE	The scoping study has been completed and a national development project will be undertaken in 2000/early 2001. This will allow better assessment of the flow needs of a watercourse and assist in achieving the right balance between abstraction and environmental protection.

CAMS - Catchment Abstraction Management Strategies EN - English Nature IFE - Institute of Freshwater Ecology
 LIFE - Lotic-invertebrate Index for Flow Evaluation AWS - Anglian Water Services Ltd R - Routine Agency costs TBE - Costs to be established

3.0 ACTIVITY PLANS

Objective

Return the downstream flow of Cringle Brook to sustainable levels.

Responsibility - Lead	Other	Action	00/	01/	02/	03/	04/	Future	Cost (£k)	Comments
			01	02	03	04	05			
Agency	AWS	Apply to the Secretary of State to vary the AWS abstraction licence in order to increase control flow.		*					circa 1 plus R	This will entail costs of the application and consultation as well as staff time and costs.

CAMS - Catchment Abstraction Management Strategies EN - English Nature IFE - Institute of Freshwater Ecology
LIFE - Lotic-invertebrate Index for Flow Evaluation AWS - Anglian Water Services Ltd R - Routine Agency costs TBE - Costs to be established

Ongoing National Initiatives

We have actively contributed to the Government's review of the abstraction licensing system and the revision of the Water Resources Act 1991. The proposed changes provide the Agency with additional tools to conduct its duty to manage water resources. These include measures to strengthen protection for wildlife and important habitats, and a duty to ensure that sites which come under the EC Habitats Directive are not adversely affected by new abstraction licenses or variations to existing ones. These may take some

time to implement but, where possible, we currently use existing legislation to promote change.

We are also committed to reviewing our National and Regional Water Resources Strategies by December 2000. This will consider our needs until 2025, highlighting the need for the Agency to work with a wide variety of organisations and interest groups (including regulators, water companies, and statutory consultees) to encourage water conservation and promote its efficient use and supply.



Cringle Brook, River Witham

3.0 ACTIVITY PLANS



Issue 1b There is concern over the sustainability of proposals to restore the Slea Navigation and the Horncastle Canal for navigation purposes



River Slea upstream of Sleaford

Local action groups are seeking to restore the Slea Navigation and Horncastle Canal in order to facilitate boating and recreation and to improve their amenity and environmental value. We currently support river levels in the River Slea in Sleaford via an augmentation borehole. The quantities of water provided are suitable for maintaining levels through Sleaford for amenity purposes only, thus creating an acceptable aesthetic standard.

The Slea Navigation Trust is currently undertaking a habitat survey of the proposed restoration of navigation to the River Slea between Sleaford and Cobbler's Lock. Any restoration of the Horncastle Canal and/or Slea Navigation must also fully address flood defence, water quality and conservation interests, however, our overriding concern is the lack of water resources for use in the restoration. Local water resources in the Slea and Bain catchments are scarce in summer months and cannot sustain any increased abstraction. Proposals for restoration will have to address the availability of water in order to make navigation feasible.

We will continue to consider proposals provided the above concerns are addressed. This should ensure sustainability of the proposals without derogation of other uses of water, and also enhance the environment.

Objective		Ensure that any use of water for canal restoration is sustainable.								
Responsibility Lead	Other	Action	00/01	01/02	02/03	03/04	04/05	Future	Cost (£k)	Comments
Agency Navigation Trusts		Continue to liaise on proposals to restore these navigations.	*	*	*	*	*	*	R	This will take place as required.
Agency		Respond to requests for information and advise on the feasibility of schemes as required.	*	*	*	*	*	*	R	As above.
Agency		Determine any applications for abstraction/impounding licences that result from the restoration proposals.	*	*	*	*	*	*	R	As above.

CAMS - Catchment Abstraction Management Strategies EN - English Nature IFE - Institute of Freshwater Ecology
 LIFE - Lotic-invertebrate Index for Flow Evaluation AWS - Anglian Water Services Ltd R - Routine Agency costs TBE - Costs to be established

3.0 ACTIVITY PLANS

2 Enhancing BIODIVERSITY

Agency Operational and Strategic Actions are to:

- play a full part in implementing the EC Habitats Directive;
- play a full and active part in delivering the UK's Biodiversity Action Plan by acting as the 'contact point' for twelve species of aquatic animals and plants, and by acting as the 'lead partner', either singly or in collaboration with others, for ten of them;
- ensure that all aspects of the Biodiversity Action Plan are incorporated into the Agency's guidance and become part of its Local Environment Agency Plans;
- implement a series of projects, in partnership with local conservation groups, to deliver biodiversity targets at specific sites;
- allocate specific resources to conservation projects aimed at increasing biodiversity;
- control eutrophication, where feasible, in order to enhance biodiversity;
- improve the management of wetlands for conservation purposes;
- use and promote best environmental practice for the protection and restoration of river habitats;
- develop and set conservation criteria for all of the Agency's environmental licensing activities;
- implement specific projects to restore habitats in rivers and lakes, increase the area of reedbeds and other water plants, and improve river banks;
- ensure that there is no deterioration in the quality of the aquatic environment in particular, and deliver significant improvements in river and still water quality by tackling diffuse pollution of them; and
- carry out research into the management of species in the aquatic environment in order to meet fully all Biodiversity Action Plan targets.



Issue 2a There has been a significant reduction in the area of river and wetland habitats and associated species

Wetland habitats are ecologically sensitive. They are dependent on surface and groundwater inputs, and are susceptible to changes in water quality. Reedbed, fen, wet grassland and wet woodland can support a wide variety of common as well as rare species, such as otter, toads, water vole, harriers and warblers.

The decrease in wetland habitats in the catchment and their fragmented nature is, however, increasing the pressure on these species. Over the last three hundred years, land drainage techniques and agricultural practices have progressively converted the productive, easily worked alluvial fen and valley bottom soils in the Plan area to intensive agriculture. Today, only limited areas of wet meadow, marsh, fen and carr are found alongside the watercourses where they would once have been abundant.

The need to defend industrial, commercial, residential and agricultural developments from flooding has meanwhile largely removed the intimate contact that the water once had with the floodplain. This has degraded the wetland habitats, whilst canalisation has also widened and deepened channels and created embankments. Furthermore, water resource management and irrigation can impact adversely on the diversity and distribution of species, particularly during periods of high abstraction and drought.

Fens, reedbeds and wet grassland are some of the habitats listed as 'high priority' in the UK Biodiversity Action Plan. Habitat quality is fundamental to the presence of a wide range of dependant fauna and flora, and habitat maintenance and creation will be a significant factor in the success of local Biodiversity Action Plans (BAPs). The first phase of the Lincolnshire BAP was published in May 2000, and the BAP will address the following river and wetland habitats and species:

3.0 ACTIVITY PLANS

Habitats	Species
chalk rivers	compressed river mussel
ponds, lakes and reservoirs	grass wrack pondweed
reedbeds	greater water parsnip
rivers, canals and drains	otter
springs and flushes	ribbed leaved water plantain
	spined loach
	water vole
	native crayfish
	Witham orb mussel

Objective Increase the area of and species associated with wetland habitats.										
Responsibility		Action	00/	01/	02/	03/	04/	Future	Cost (£k)	Comments
Lead	Other		01	02	03	04	05			
County BAP Groups	Other Partners	Participate in the development and implementation of local BAPs.	*	*	*	*	*	*	28	This sum reflects the costs to all partners for preparation and production of the plans.
EN RSPB Agency LAs BW		Seek and create opportunities for the formation of new areas of wetland habitat and restoration of the floodplain, including works at:	*	*	*	*	*	*	TBE	Works will be undertaken where opportunities and funding arise. One example is the wetland restoration being carried out behind the realigned bank at Freiston (see Section 3.2). Another example is the wet vegetated berm introduced as part of bank and toe revetments on the Lower Witham, Barlings Eau and River Bain.
		Fiskerton	*							
		Upper Bain	*							
		Lower Barlings Eau	*							
Objective Conserve and enhance existing areas of wetland habitat.										
Responsibility		Action	00/	01/	02/	03/	04/	Future	Cost (£k)	Comments
Lead	Other		01	02	03	04	05			
FWAG FRCA WT Agency BW		Restore and recreate habitat by collaborating with landowners and conservation bodies.	*	*	*	*	*	*	R	We will continue to provide support and advice for agri-environment schemes, such as Countryside Stewardship agreements, that have benefits for wetland habitats. We also suggest areas that have the potential for such schemes.

FWAG - Farming and Wildlife Advisory Group FRCA - Farming and Rural Conservation Agency WT - Wildlife Trusts LA - Local Authority
 BW - British Waterways BAP - Biodiversity Action Plan RSPB - Royal Society for the Protection of Birds

3.0 ACTIVITY PLANS



Issue 2b The introduction of invasive alien plant and animal species threatens the ecological diversity of our natural environment

(i) Alien plants

Several invasive species have colonised river corridors and wetlands in the Witham catchment, including Giant Hogweed, Japanese Knotweed, Himalayan Balsam and swamp stonecrop. These introduced species are out-competing native plants and reducing floral diversity. The dense stands often impede access to the riverbank, leading to difficulties and added expense during routine maintenance whilst hindering leisure and recreation. In addition, many of these aliens die back in winter, whereas less vigorous native species maintain a tight sward throughout the year. This can lead to bare banks that are prone

to erosion by winter flows, whilst the volume of material produced by this die-back can clog channels downstream.

Due to their aggressive dominance and difficulty to control, both Japanese Knotweed and Giant Hogweed have been added to the list of plants which it is an offence to introduce into the wild under the Wildlife and Countryside Act (1981). Meanwhile, despite its ability to escape from gardens and colonise the wider countryside, Himalayan Balsam is still sold for its attractive foliage and flowers.

Alien invasive plant populations within the Plan area may, however, still be at a level where control is feasible, and opportunities to this end should be taken wherever possible. It is important to appreciate that no single organisation can tackle this issue due to practicalities and resource implications. Instead, the problem should be tackled by a number of organisations in partnership.

Objective Control and contain the spread of alien plant species along watercourses.										
Responsibility		Action	00/	01/	02/	03/	04/	Future	Cost (£k)	Comments
Lead	Other		01	02	03	04	05			
Agency LAs IDBs BW Land-owners		Identify sites where alien invasives have become established.	*	*	*	*	*	*	R	Our flood defence asset surveys now contain a provision for this.
Agency		Provide advice on the control of invasive weeds.	*	*	*	*	*	*	R	Agency Biology section staff are BASIS registered to carry this out.
Agency LAs IDBs		Undertake a baseline assessment of their distribution.	*	*	*	*	*	*	R	
Agency LAs IDBs		Develop a catchment-based strategic approach to their control.	*	*	*	*	*	*	R	

IDB - Internal Drainage Board BASIS - British Agrochemical Standards Inspection Scheme BW - British Waterways LA - Local Authority

ii) American Mink

The American Mink has been establishing itself along watercourses in Britain since the 1950s and reports of mink in the Witham catchment suggest that they are locally on the increase.

Predation by mink has already played a significant part in the accelerating decline in native water vole populations nationwide. Sustainable water vole populations, which are currently found throughout the catchment, would be greatly threatened if they became fragmented and depleted by mink. Other threats to water voles from altered riparian

management and development along watercourses have been addressed by the Wildlife and Countryside Act (1981). There is some evidence to suggest that high quality riparian habitats, such as expansive reedbed and diverse marginal zones, mitigate the impact of mink predation.

We have already assessed the distribution of mink in the Plan area. Observations were documented as part of the County Otter Survey 1999 and the subsequent intensive Otter Survey of the River Bain. The results of these studies were used in the formulation of local Biodiversity Action Plans.

3.0 ACTIVITY PLANS

Objective Reduce/eliminate the threat to biodiversity from the American Mink.										
Responsibility Lead	Other	Action	00/01	01/02	02/03	03/04	04/05	Future	Cost (£k)	Comments
County BAP Group		Prepare local Biodiversity Action Plans for the water vole and wetland habitats that support it.	*						28	The Lincolnshire Biodiversity Action Plan, published in May 2000, contains actions which support the water vole. This sum reflects the costs to all partners for preparation and production of the plans.
Those who manage waterside habitats		Implement actions in the BAP.	*	*	*	*	*	*	TBE	These will arise from the BAPs themselves.
Agency		Enhance marginal habitat along watercourses during routine maintenance and capital works.	*	*	*	*	*	*	TBE	This is undertaken as opportunities arise. One example is the wet vegetated berm introduced as part of bank and toe revetments on the Lower Witham, Barlings River and River Bain, providing habitat in which the water vole is more able to withstand predation by mink.

Ongoing National Initiatives

We have formulated a national policy document on the American Mink and are currently working with Oxford University Wildlife Conservation Research Unit to study the effects of mink on water voles. We do not have responsibility for the control of mink, but we can provide general advice on the problem.

iii) Signal Crayfish

The native crayfish (*Austropotamobius pallipes*) is a threatened species, protected by both UK and EC legislation, and is one of the UK Biodiversity Action Plan 'priority species'. It is particularly threatened by the introduced Signal Crayfish, which is present in the Witham catchment. The Signal Crayfish can

carry 'crayfish plague', which is particularly virulent amongst the native population, and competes for food and habitat. Habitat modification and river management regimes also contribute to the decline in native crayfish populations, and some local populations have already been eliminated, e.g. on the Upper Bain.

A 1996 Order under the Import of Live Fish Act 1980 afforded some protection to the native crayfish by prohibiting the keeping of alien crayfish without a licence in some postal districts. Exceptions were, however, made to this Order to allow for the development of the Signal Crayfish for the food market. As a result, some areas within the catchment need to comply with licensing requirements whilst adjacent areas do not.

Objective Assess and monitor the spread of non-native crayfish.										
Responsibility Lead	Other	Action	00/01	01/02	02/03	03/04	04/05	Future	Cost (£k)	Comments
Agency	EN WT Land-owners Other Partners	Co-ordinate and direct effort into monitoring and developing a strategy for the conservation of the native crayfish.	*	*	*	*	*	*	TBE	A working group has now been established in order to develop the strategy.

Objective Protect native crayfish populations in the catchment.										
Responsibility Lead	Other	Action	00/01	01/02	02/03	03/04	04/05	Future	Cost (£k)	Comments
County BAP Groups	Other Partners	Develop and implement local Biodiversity Action Plans for the native crayfish and its habitats.	*	*	*	*	*	*	TBE	The Lincolnshire BAP, published in May 2000, includes plans for the native crayfish and its habitats.

3.0 ACTIVITY PLANS

3 Managing Our FRESHWATER FISHERIES

Agency Operational and Strategic Actions are to:

- secure a more robust funding base for fisheries management by improved marketing and the setting of fair charges to anglers;
- review the economic basis of fisheries management;
- introduce a standard fisheries classification scheme;
- monitor every river fisheries over a five year rolling cycle;
- restore spawning grounds for freshwater fish;
- implement a programme of minimum acceptable flows for rivers;
- develop specific longer-term strategies for salmon, trout and coarse fisheries;
- reduce poaching to a minimum and bring rod licence evasion to under 10%;
- consider the likely costs and benefits of fixed penalty fine schemes for rod licence offences;
- consider the desirability of introducing mandatory rod licence display systems; and
- research into the factors which affect the viability of our unique freshwater fisheries populations.



Issue 3a There is local and national concern from anglers regarding the poor quality of match angling sport

Falling fish catches reported within the catchment by anglers have led to considerable concern from the fishing fraternity. There has been some speculation that the improved quality of industrial and water company discharges to the River Witham has reduced the levels of nutrients needed by young fish. It has also been proposed that the perceived decline is affecting the numbers of fishermen joining angling clubs.

In 1998, the Agency carried out a routine fisheries survey on the River Witham, from Lincoln downstream to Boston. This was the sixth routine fisheries survey following previous studies in 1982, 1985, 1988, 1991 and 1994. The surveys provide an insight into the status of the fish stocks in the Witham, and help us to identify changes that might adversely affect angling success.

In the summer of 1998:

- 29 routine survey sites were sampled, either on the Main River, or on those with open connections to the Lower Witham;
- in total 29,790 fish were caught from 18 different fish species;
- roach was the dominant species, in terms of both number and weight, followed by common bream;
- despite inevitable differences between individual sites, at comparable sites the mean fish biomass has changed little between 1994 (27.3 g/m²) and 1998 (26.7 g/m²).

With roach, the most popular angling species on the river, the mean biomass has remained remarkably constant at all sites:

YEAR	ROACH MEAN BIOMASS GM ⁻²
1982	7.54
1985	6.67
1988	6.26
1991	6.93
1994	6.83
1998	6.41

3.0 ACTIVITY PLANS

These results indicate that fish distribution within the system may explain recent angling form. During our 1998 investigation, large numbers of fish were caught in some of the downstream

sections towards Boston and the same trend appears now, with double figure mixed bags of perch, roach and skimmers recently taken from this area.

Objective Increase monitoring of the River Witham fisheries.										
Responsibility		Action	00/	01/	02/	03/	04/	Future	Cost (£k)	Comments
Lead	Other		01	02	03	04	05			
Agency		Implement a program of 5-yearly fisheries surveys.	*	*	*	*	*	*	R	
Agency		Carry out a further survey of the River Witham.	*						R	This will be undertaken during summer 2000 as part of the above.
Objective Assess whether fish biomass levels fall within standard variance.										
Responsibility		Action	00/	01/	02/	03/	04/	Future	Cost (£k)	Comments
Lead	Other		01	02	03	04	05			
Agency		Undertake further detailed assessment of fish biomass levels.	*						R	This will be carried out in conjunction with the above survey.
Objective Obtain a greater understanding of the situation.										
Responsibility		Action	00/	01/	02/	03/	04/	Future	Cost (£k)	Comments
Lead	Other		01	02	03	04	05			
Agency		Investigate the potential for and formulate research and development programs.	*	*	*	*	*		TBE	This will include both fisheries and other aspects of the River.



Issue 3b Fish populations across the River Witham catchment suffer from degraded habitat and river management practices

Since the Fens were drained in the sixteenth century, much of the River Witham and its tributaries have been engineered to drain agricultural land and provide the efficient relief of floodwaters. The watercourses are generally long, straight and embanked with little gradient, and the channels are also trapezoidal with few features to benefit fish or associated flora and fauna.

Although the fish population has, in many ways, adapted to this "unnatural" environment, several problems remain:

- the lack of marginal vegetation and tree cover denies fish shelter and shade;
- the largely uniform river bed gradients and lack of deeper holes deny fish cooler deep water during summer months and the refuge needed during spate flows;

- saline intrusion (Issue 4h) occurs periodically, exacerbated by low flows (due to low rainfall and abstraction);
- eutrophic conditions (Issue 4f) lead to extreme oxygen level ranges in rivers, prolific plant and algal growth and increased sedimentation. These cause distress to fish and create adverse breeding conditions.

These problems are exacerbated during winter months as water levels are lowered to ensure that flood storage capacity is available in the event of high flows. The deepest areas in the pumped systems are often around and immediately upstream of the pumping station, and so shoaling fish are sometimes lost through the pumps. Fish can also become stranded in ponded lengths, unable to move from hole to hole as the water levels are lowered, making them vulnerable to predators and pollution. One option to address this issue is the provision of artificial fish refuges. For example, the pipes installed as part of a project to revet eroding banks on the River Witham at Fiskerton replicate undercut/overhanging bank features.

3.0 ACTIVITY PLANS

Objective Increase habitat diversity.

Responsibility Lead Other	Action	00/	01/	02/	03/	04/	Future	Cost (£k)	Comments
		01	02	03	04	05			
Agency	Undertake habitat improvements on the channels and banks of watercourses in association with flood defence schemes.	*	*	*	*	*	*	TBE	This will be carried out as opportunities arise. Examples include the works to establish/ increase vegetated margins and revetments (see Issue 2).

Objective Provide refuges for fish in extreme conditions.

Responsibility Lead Other	Action	00/	01/	02/	03/	04/	Future	Cost (£k)	Comments
		01	02	03	04	05			
Agency	Seek out sites and methods that are suitable for installing artificial features that provide fish refuges.	*	*	*	*	*	*	TBE	This will provide the sheltered fish habitat that has been lost from the natural environment.
Agency	Install artificial features.	*	*	*	*	*	*	TBE	As above. This will be carried out as opportunities arise.



Navigation structure impeding fish pass

3.0 ACTIVITY PLANS



Issue 3c The upstream and downstream free passage of fish is restricted by weirs, locks and other impoundments, which also alter the aquatic environment

Fish need to migrate for many different reasons, such as spawning, feeding and avoiding pollution and predators. Obstructions and barriers can however prevent the free passage of fish species such as brown trout, barbel, chub, grayling and eel, which need to move freely through a river system during certain stages of their lifecycle. Brown trout and grayling in particular have been noted as threatened through their inclusion on the UK Biodiversity Action Plan as a Species of Conservation Concern.

Areas upstream of impoundments may no longer reflect the habitat and species typical of the river type and topography. This is due to impacts on the dynamics of the watercourse and transport of suspended solids, which lead to changes in flora and fauna upstream. The impacts are particularly apparent where the impoundment creates a large difference in water level, such as on the Upper Bain and Witham, where it can be as much as 2m.

All discharges of water to the sea in the catchment are subject to control by pump, sluice or tidal gate. These structures may further prevent the free movement of fish species that need to migrate between the sea and freshwater to complete their life cycle, such as sea trout, eels and smelt.

We are aiming to remove barriers to fish migration as opportunities arise. Several of the new gauging stations in the Plan area (Issue 5e) incorporate ameliorating measures, for example the new gauging station at Victoria Mill on the River Bain at Horncastle now has a number of baffles and a shallower profile to ease fish movement.

Objective		Reduce obstacles to fish movement.								Cost (£k)	Comments
Responsibility Lead	Other	Action	00/01	01/02	02/03	03/04	04/05	Future			
Agency	IDBs	Install fish passes as opportunities arise.	*	*	*	*	*	*	TBE	This will be carried out in conjunction with local flood defence projects.	
Agency		Identify opportunities for removing/modifying existing structures.	*	*	*	*	*	*	TBE	The installation of new ultrasonic gauging stations is one option that decreases barriers to fish movement.	

3.0 ACTIVITY PLANS

4 Delivering INTEGRATED RIVER-BASIN MANAGEMENT

Agency Operational and Strategic Actions are to:

- manage river-basins in an integrated way, via Local Environment Agency Plans;
- ensure that all waters are of sustainable quality for their different uses;
- deliver a continual improvement in overall water quality;
- provide effective flood defence;
- provide an effective flood warning system;
- increase the numbers of rivers and still waters capable of supporting viable fisheries;
- enhance and conserve inland navigations, as national assets of environmental, economic, social and recreational value;
- secure the most appropriate legislation, management systems and financial arrangements to ensure the sustainability of our navigational waters;
- work with others to improve and develop inland waterways as an integrated network;
- improve river habitat quality, as measured by river habitat surveys;
- improve wetland management;
- improve riverside landscapes;
- improve bathing water quality;
- improve estuarine waters for shellfisheries;
- increase the number of Agency-owned sites available for public recreation; and
- work with local authorities to maximise the conservation and recreational use and value of our river-basins.



Canoeists on the Witham

3.0 ACTIVITY PLANS



Issue 4a The increasing demand and new opportunities for leisure activities associated with the river environment can have conflicting impacts on the natural resource and other users

The countryside has always been an attractive area for leisure pursuits. River corridors are important as they can accommodate activities ranging from angling and boating to bird watching and cycling, and we actively promote such interests. Our principal aim for recreation is to protect, improve and promote the water environment for recreational use. We do this by protecting existing uses and creating opportunities in the course of our work, and by maximising the use of Agency-owned sites for recreation.

Without suitable management, however, the increasing pressure to absorb a greater intensity of traditional pursuits and accept new ones can create conflicting impacts on water resources, water quality, flood defences, habitats and flora and fauna.

A lack of recreational access may also impair leisure activities. Crossing points along the River Witham are few and far between, for example there are none along the stretch between Bardney and Kirkstead, near Woodhall Spa. This issue may become increasingly important as the use of footpaths increases and a proposed cycleway is constructed.

In addition, although the Witham Navigable Drains, which include lengths of the Hobhole and Maud Foster/Stonebridge Drain system, are being promoted for further recreational development, navigational responsibility for these systems remains uncertain. At a recent meeting, a number of interested parties discussed the navigational responsibility, and it is hoped that another meeting in the near future will clarify this matter.

Overall, we will continue our attempts to improve liaison between user groups and achieve an understanding of their various needs, and to reconcile these with the needs of the environment.

Objective		Ensure that increasing leisure opportunities are accommodated without causing harm to the environment.									
Responsibility	Action	00/01	01/02	02/03	03/04	04/05	Future	Cost (£k)	Comments		
Lead	Other										
Agency Other Partners	Work in partnership with recreational and other organisations to meet the demands of users whilst recognising the need for restraint in more sensitive areas.	*	*	*	*	*	*	TBE	This should help to resolve/address any potential conflicts between recreational needs and the environment.		
Agency Planning Author- ities Other Partners	Carry out Environmental Impact Assessments before leisure facilities and activities are developed in the Plan area	*	*	*	*	*	*	TBE	This should help to resolve/address any potential conflicts between recreational needs and the environment.		
Agency Other Partners	Resolve navigational responsibility for the Witham Navigable Drains	*	*					R			

3.0 ACTIVITY PLANS



Issue 4b The escape of aviation fuel into the aquifer underlying RAF Waddington continues to pose a risk to the environment

The proximity of an activity to a groundwater abstraction is one of the most important factors in assessing the risk of groundwater pollution. All groundwater sources, including springs, wells and boreholes, are liable to contamination and need to be protected.

We designate Source Protection Zones (SPZs) (areas over which recharge is captured by an abstraction borehole) to protect potable water supplies against pollution. There are three recognised groundwater Source Protection Zone classifications:

- Zone I (Inner Source Protection) – an area defined by a 50-day travel time from any point below the water table to the source and a minimum of 50-metres radius from the source.
- Zone II (Outer Source Protection) – an area defined by a 400-day travel time from any point below the water table to the source.
- Zone III (Source Catchment) – the complete catchment area of a groundwater source.

RAF Waddington lies on a major aquifer in a Zone III SPZ. In 1993, the RAF discovered a leak of aviation fuel from a faulty valve and pipework. Initial estimates suggested that 35,000 litres of fuel had escaped into the aquifer and a remediation scheme was commissioned using a network of boreholes. Air was injected into the boreholes to accelerate the biodegradation of the fuel, and the removal of an equivalent volume of fuel was achieved. In 1998, however, a further leak of some 15,000 litres was detected. Additional techniques are being employed to remove the product via the boreholes.

Objective		Contain and remediate the escape of aviation fuel into the aquifer underlying RAF Waddington.								
Responsibility Lead	Other	Action	00/01	01/02	02/03	03/04	04/05	Future	Cost (£k)	Comments
RAF	Agency	Apply remediation techniques to recover the escaped aviation fuel.	*	*	*	*	*	*	NA	The RAF is responsible for the remediation and clean-up costs. This should ensure the satisfactory remediation of the aquifer.
	Agency	Continue to liaise with the RAF in order to increase awareness of groundwater protection issues.	*	*	*	*	*	*	1 p.a.	This will reduce the risk of pollution incidents in the future.
	Agency	Monitor groundwater quality.	*	*	*	*	*	*	1 p.a.	

NA - Non-Agency costs

3.0 ACTIVITY PLANS



Issue 4c Nitrate concentrations in some ground and surface waters exceed, or are expected to exceed the EC Nitrate Directive limit.

Ground and surface waters are highly vulnerable to diffuse sources of pollution, including agricultural run-off, and high concentrations of nitrate have been measured in groundwaters in the Witham catchment.

As a result, nitrate concentrations may exceed the EC Drinking Water Directive limit of 50mg/l. This limit was set in response to concerns over the impact of high nitrate concentrations on human health. Water with a high nitrate concentration is either blended with low nitrate water or treated before being put into potable supply by the water undertakers.

In March 1996, in accordance with the EC Nitrate Directive, the Government designated 68 Nitrate Vulnerable Zones (NVZs) in England and Wales in areas where nitrate concentrations in drinking water sources exceeded, or were at risk of exceeding, the 50mg/l limit. An area around the upper stretches of the River Witham, in the catchment of Cringle Brook, and part of the Lincolnshire Limestone outcrop between Grantham and Lincoln were designated the River Witham and Lincoln NVZs respectively. Farmers were required to comply with a statutory Action Programme based on good agricultural practice, in order to reduce nitrate leaching.

In 1990, prior to the designation of NVZs, the UK Government introduced a voluntary Nitrate Sensitive Areas (NSA) scheme to test the effectiveness of reducing nitrate concentrations in water by placing restrictions on agricultural practices. Initially, 10 Pilot NSAs were designated, including two in the LEAP area at Sleaford and Branston Booths, followed by a further 22 since 1994, including one at Aswarby. Within the NSAs, farmers are compensated over a five year period for making changes to their farming systems that go substantially beyond Good Agricultural Practice in order to achieve reductions in nitrate levels. All 32 NSAs are within NVZs where mandatory Action Programme measures now apply. Where the NSA and NVZ rules overlap, the more demanding of the two applies. The NSA scheme was closed to new applications in 1998.

There is a perception that, if areas of grassland coming out of agreement are returned to arable use, there could be a significant release of stored nitrogen to the water environment. However, during the relatively short period that such areas have been down to grass, the grazing and fertiliser regime has been tightly controlled and it is considered that there will not be a significant release of nitrogen. In addition, adherence to the mandatory NVZ Action Programme will reduce the impact of such a conversion and ensure that the benefit accrued to date continues.

NVZ designations are reviewed on a four-yearly basis and more land may be designated in the future where nitrate concentrations in water exceed, or are in danger of exceeding the 50 mg/l limit.

Objective		Reduce the amount of nitrate leaching into surface and groundwaters.									
Responsibility Lead	Other	Action	00/01	01/02	02/03	03/04	04/05	Future	Cost (£k)	Comments	
Farmers	Farming Advisors	Adhere to compulsory Action Programme rules governing nitrogen application within designated areas.	*	*	*	*	*	*	NA	Since December 1998, farmers in NVZs have been required to comply with a statutory Action Programme, based largely on Good Agricultural Practice, to reduce nitrate leaching from their land. We are responsible for assessing farmer compliance with the NVZ regulations. These measures are uncompensated, although grants to improve farm waste storage facilities under the MAFF Farm Waste Grant Scheme may be available to farmers within NVZs.	
	Agency	Ensure compliance with the above through farm inspection visits/ performance audits.	*	*	*	*	*	*	30 p.a.		
	Agency	Monitor receiving water courses.	*	*	*	*	*	*	R		

3.0 ACTIVITY PLANS



Issue 4d Contaminated land has the potential to cause further pollution and harm to human health

In general, contamination of land may be present in many sites in the UK as a result of uncontrolled waste disposal or industrial use. It is often associated with processes which are now obsolete. As well as sites affected by substances occurring as a result of man's activity, in some places areas of land are affected by 'natural' substances, including natural sources of methane, or metals and other chemical substances which occur in rocks and soil. Less stringent legislation in the past has left a legacy of land which must be remediated to enable their safe use in future without harm to human health or the environment.

New legislation (Section 57 of the Environment Act 1995), which came into effect on 1st April 2000, has introduced a legal definition of contaminated land. The legislation focuses on sites which could cause problems in their current use. The Contaminated Land (England) Regulations 2000 provide a new legal framework for dealing with contaminated land, and give the Agency new powers which complement those of the local authorities to deal with land which is causing, or is likely to cause, unacceptable risks to human health and the environment.

The Regulations provide a means of ensuring remediation of statutory contaminated land. The regulations promote voluntary remediation, with Remediation Notices being issued as a last resort. Remediation in conjunction with development through the planning process will be encouraged. Certain contaminated land which falls within the definition of "special sites" will become the responsibility of the Agency. The principle underpinning the remediation of contaminated land is that the polluter pays. Where the polluter cannot be identified the costs of remediation may fall to the site owner or the occupier. Where a polluter or owner-occupier cannot be found, sites will be designated as "orphan sites". As a last resort central government funding may also be available for these sites.

There are a number of potential statutory contaminated sites in the Plan area:

FORMER BOSTON GASWORKS

The site of the former Boston Gasworks has been shown to have elevated concentrations of cyanide and other contaminants. Workmen on an adjacent school development site required hospital treatment following trench excavation works. Interim remediation has been agreed in order to open the school in September 2000 and long-term proposals for remediation are ongoing.

Proposed remediation of the planned school playing fields includes the removal of highly contaminated soils to landfill, followed by capping with a clay liner. Other works on the site will include the removal of the former gas holders and replacement of the surface water balancing pond to the east of the school. Remediation works should begin in June 2000, with the school scheduled to open in September 2000 subject to full remediation of the surrounding area. The Environmental Health Office at Boston Borough Council will be overseeing remediation at the site with the Agency playing a supportive role.

ST MARK'S, LINCOLN

In 1989 the former bus depot at St Mark's in Lincoln was found to have suffered an extensive leakage of diesel. It was feared that a vast quantity of up to 454,000 litres had escaped over the years. The site is adjacent to the River Witham but there does not appear to have been any deleterious effect on the watercourse, perhaps due to the presence of extensive sheet piling.

The then landowner commissioned a remediation scheme involving a network of boreholes designed to recover the diesel. Over 35,000 litres of diesel have now been recovered and it appears that the initial estimate may have been excessive.

Additional site works have however identified that the contamination has migrated. The appointed consultants have therefore installed a further recovery trench to remove the free product at this location. It is anticipated that the system will now remain operational until autumn 2000, at which point a risk assessment will establish whether there is a need for ongoing remediation.

3.0 ACTIVITY PLANS

SKEWBRIDGE

Redevelopment schemes are being evaluated for the former landfill site at Skewbridge in Lincoln. The site was a major waste disposal facility serving the city of Lincoln and its surroundings in the late 1960s and 1970s, covering some 22 hectares with up to 3 metres depth of household, commercial and industrial waste. Hazardous substances including asbestos were also disposed of and so remediation will require particular caution. The position of the landfill in relation to the Swanpool and connected surface waters increases the complexity of this site.

LINCOLN GASWORKS

We were advised by North Kesteven District Council that a blue substance was observed on the surface of derelict land next to the main gasworks after heavy rainfall. Laboratory analysis revealed the blue contaminant to be ferric ferrocyanide (blue-billy) and the site has now been capped with a clay/topsoil mixture to sever the pollutant linkage. A detailed Site Investigation with associated Risk Assessment is planned and we are advising the Project Team, headed by North Kesteven District Council.

Objective		Remediate/develop contaminated land.								
Responsibility Lead	Other	Action	00/01	01/02	02/03	03/04	04/05	Future	Cost (£k)	Comments
LAs	Agency	Implement Contaminated Land provisions of the Environment Act 1995.	*	*	*	*	*	*	TBE	These provisions came into force on 1st April 2000.
	Agency	Maintain liaison and advice.	*	*	*	*	*	*	R	
	Agency Polluter Land-owner	Bring about the remediation of designated "Special Sites".	*	*	*	*	*	*	TBE	



Issue 4e Routine chemical and biological monitoring indicates poor water quality at a number of sites/stretches in the plan area

We use two principal schemes for managing and reporting river quality: the General Quality Assessment (GQA) scheme and the Water Quality Objectives (WQO) scheme.

The GQA scheme is used to make periodic assessments of the quality of river water on key stretches (i.e. those which receive significant discharges or have significant flow) in order to monitor geographical and temporal trends in terms of general chemistry and biology. We are also developing a means of assessing watercourses in terms of nutrient content and aesthetic value.

The WQO scheme establishes clear quality targets to provide a commonly agreed planning framework for regulatory bodies and dischargers alike. The scheme, which is still under development, considers the different uses of a river stretch, including that of River Ecosystem.

The River Ecosystem (RE) category considers the chemical quality requirements of different types of aquatic ecosystem. Each stretch of river is assigned a target RE class called a River Quality Objective (RQO), which represents the level of water quality that a river should achieve in order to be suitable for its agreed uses. Until WQOs are formally established, we will use RQOs to set discharge consents and undertake other water quality planning activities.

Biological quality targets are set locally, based on land-use related parameters.

3.0 ACTIVITY PLANS

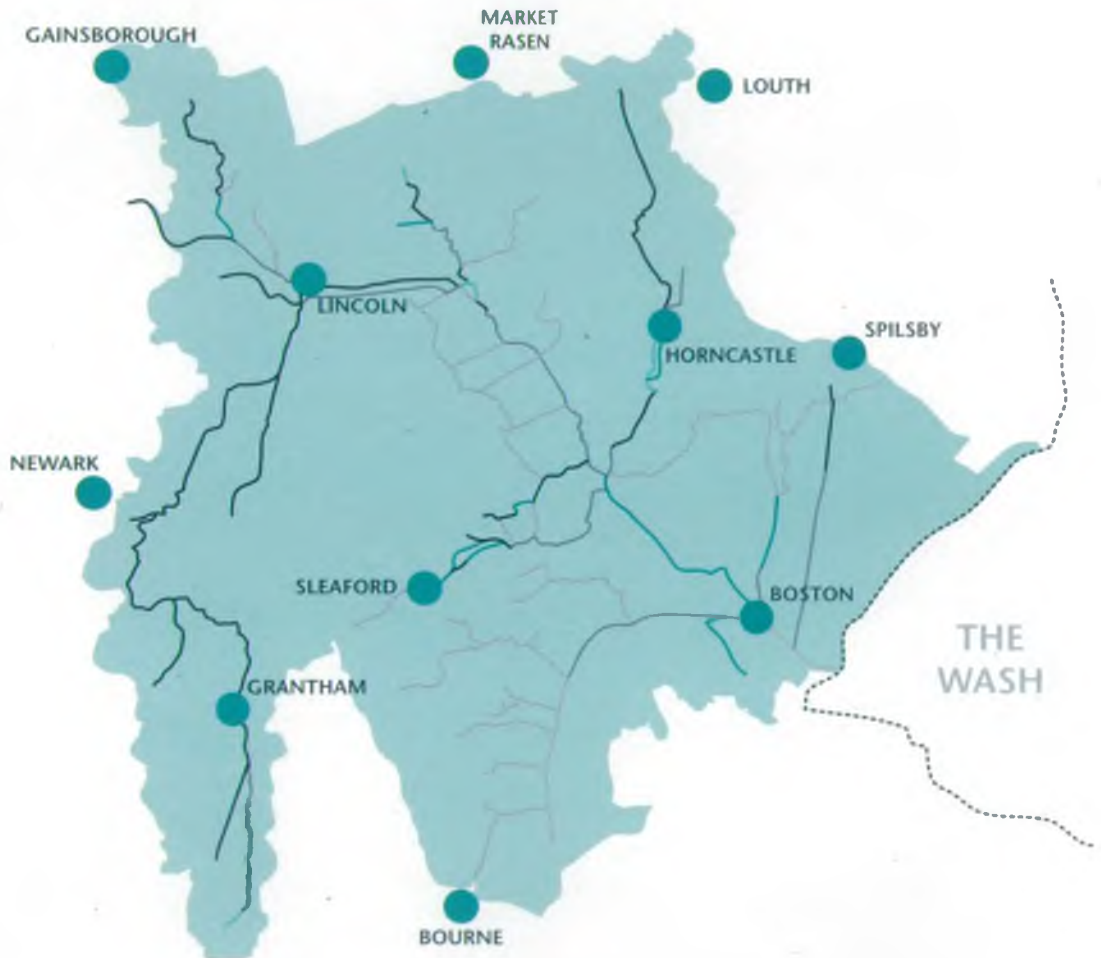
The River Ecosystem Classification Scheme

RQO CLASS	CLASS DESCRIPTION
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 class 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.

Map 1

Compliance Against River Ecosystem Targets (Data for the three years ending September 1998)

-  Significant failure
-  Marginal failure
-  Compliant
-  Insufficient data
-  Main river



A number of river stretches in the catchment fail to achieve their RE target classes, either marginally or significantly (Map 1).

The majority of failures against River Ecosystem targets refer to reduced oxygen concentrations or elevated biological oxygen demand. These cannot be related to effluent discharges or specific pollution sources, and instead are due to either eutrophic effects or the 1995-1997 drought (figures used in calculating RE targets span a three year period).

Statistically Significant Failures (due to specific pollution sources)

The Old Lea between Sleaford sewage treatment works and Cobblers Lock
 The Old Lea is adversely affected by ammonia contamination from Sleaford sewage treatment works (STW). This site has an intermittent long-term biological failure and has been identified for inclusion in AWS's Third Asset Management Plan (AMP3). Measures for phosphate removal will also be required by 2004 under the Urban Waste Water Treatment Directive (Issue 4f).

3.0 ACTIVITY PLANS

Frampton Town Drain - Frampton to New Hammond Beck

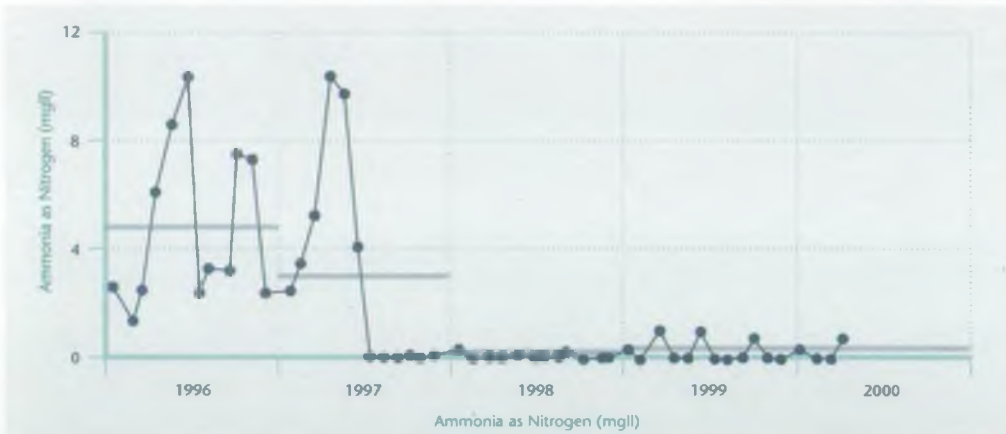
Frampton Town Drain is affected by the effluent discharge from Frampton STW. Again, this longstanding problem has been identified in AMP3. Eutrophication also affects this watercourse.

biological failure due to effluent. A scheme to improve the performance of the works has, however, been completed and the effluent is much improved whilst there are also signs of ecological recovery. The changes in water quality as a result of these works are shown below.

Nettleham Beck - Nettleham STW to Barlings Eau

The Nettleham Beck has been adversely affected by the sewage works, due to both ammonia contamination and a consistent and long-term

Monitoring establishes the success of the works, with the stretch showing compliance when historical failing data no longer falls within the three-year reporting period. No further action is anticipated for this watercourse.



Ammonia Concentrations In Nettleham Beck (Downstream of Nettleham stw) 1996-2000

Objective Improve water quality in the Old River Slea.										
Responsibility		Action	00/	01/	02/	03/	04/	Future	Cost (£k)	Comments
Lead	Other		01	02	03	04	05			
AWS	Agency OFWAT	Undertake improvement works at Sleaford STW under AMP3 obligations.					*		NA	Responsibility for and costs of implementing the works are down to AWS. Works are scheduled for completion by December 2004.
Agency		Sign off works undertaken when completed.					*		R	
Objective Improve water quality in the Frampton Drain.										
Responsibility		Action	00/	01/	02/	03/	04/	Future	Cost (£k)	Comments
Lead	Other		01	02	03	04	05			
AWS	Agency OFWAT	Undertake improvement works at Frampton STW under AMP3 obligations.					*		NA	Responsibility for and costs of implementing the works are down to AWS. Works are scheduled for completion by December 2004.
Agency		Sign off works undertaken when completed.					*		R	
Objective Continue to monitor water quality in failing stretches.										
Responsibility		Action	00/	01/	02/	03/	04/	Future	Cost (£k)	Comments
Lead	Other		01	02	03	04	05			
Agency		Monitor discharge.	*	*	*	*	*	*	R	This will enable us to identify trends and investigate failures where appropriate.

OFWAT - Office of Water Trading

3.0 ACTIVITY PLANS

FAILURES DUE TO EUTROPHICATION AND LOW FLOWS

The following stretches have experienced failures against their River Ecosystem targets due to high nitrate levels, demand for oxygen by microscopic organisms and low flows:

- River Till - Kexby Beck to Fosdyke Canal
- Old Bain - Waring to Horncastle Canal
- Old Bain - Horncastle STW to Dalderby Ford
- Old Slea - Sleaford STW to Cobblers Lock
- Frampton Town Drain - Frampton to New Hammond Beck
- Stone Bridge Drain - Sibsey to Cowbridge Lock

Actions to address these problems are contained in Issue 4f.

OTHER BIOLOGICAL CONCERNS

The following table reflects lengths of river which fail to meet biological targets. Investigations will be carried out at these sites and these will allow us to identify any appropriate actions, which will be reported on in future Annual Reviews.

Marginal Failures

Marginal failures occur where we are statistically uncertain as to whether a failure really exists. A number of marginal failures against River Ecosystem targets have been identified in the Plan area and these are mostly thought to be due to eutrophication or low flows. It is not intended to commit additional resources to these failures at this time, although routine monitoring will continue and action will be taken should failures change from marginal to significant.

Other Biological Concerns

RIVER	LOCATION	COMMENTS
Cringle Brook	Downstream of Skillington STW	Consistent long-term failure, although recent data reached the target level.
Mow Beck	Downstream of Harlaxton STW (Lake)	Intermittent and occasional serious failure.
Reepham Beck	Downstream of Reepham STW	Intermittent failure although most recent data achieved target. Proposals for improvements already exist as part of the AMP 3 process.
River Bain	Ludford	General failure. Low flows during high summer are experienced.



Issue 4f Nutrient enrichment of watercourses in the Plan area impacts on water quality and affects flora and fauna and other uses of water, such as navigation, amenity and fishing. River Ecosystem quality targets can be compromised

Our 1997 Environmental Strategy highlighted the need to address the environmental impacts and risks associated with eutrophication. Eutrophication occurs where human activities including agriculture (fertiliser applications – see Issue 4c) and waste water production (domestic and industrial) increase the nutrient content of water. Enrichment of waters by inorganic plant nutrients results in the production of algae and/or other aquatic plants, affecting water quality and dissolved oxygen levels, and disturbing the ecological balance. This can in turn lead to reduced biological diversity, excessive weed growth and algal blooms, and may also interfere with water uses such as angling and boating. Phosphate is the key nutrient controlling eutrophication in freshwater.

The EC Urban Waste Water Treatment Directive (UWWTD) specifies minimum standards for sewage treatment and collection. We are responsible for making sure that discharges receive the level of treatment specified in the Directive. Watercourses that directly or indirectly receive qualifying discharges (from works serving populations greater than 10,000) and fulfil certain criteria set out in DETR guidance can also be designated as Sensitive Areas (Eutrophic) or SA(E)s. This requires phosphate removal to Directive standards at implicated sewage treatment works, unless it can be demonstrated that such removal would have no effect on eutrophication.

The River Witham has been designated a SA(E) and therefore phosphate removal will be required at Marston, North Hykeham, Canwick, Anwick and Sleaford STWs, as well as any qualifying industrial discharges. Works to provide phosphate removal for these discharges must be completed by the end of 2004.

3.0 ACTIVITY PLANS

Objective Gain greater confidence in classification of eutrophic status.										
Responsibility		Action	00/ 01	01/ 02	02/ 03	03/ 04	04/ 05	Future	Cost (£k)	Comments
Lead	Other									
Agency		Gather and review data from rivers which show symptoms of eutrophication.	*	*	*	*	*	*	R	
Objective Increase understanding of the potential for eutrophication and identify problem areas.										
Responsibility		Action	00/ 01	01/ 02	02/ 03	03/ 04	04/ 05	Future	Cost (£k)	Comments
Lead	Other									
Agency		Carry out chemical and biological monitoring.	*	*	*	*	*	*	R	
Agency		Gather information on the effects of nutrient enrichment.	*	*	*	*	*	*	R	
Objective Reduce phosphate inputs to surface water.										
Responsibility		Action	00/ 01	01/ 02	02/ 03	03/ 04	04/ 05	Future	Cost (£k)	Comments
Lead	Other									
AWS Industry		Install phosphate removal at qualifying STWs and industrial sites under UWWTD obligations: Marston STW North Hykeham STW Canwick STW Anwick STW Sleaford STW		*					NA	This will involve the costs to AWS of the phosphate removal plant plus on-going operation costs. The target completion date for STWs is December 2004.
Agency		Monitor compliance with UWWTD requirements.	*	*	*	*	*	*	R	

UWWTD - Urban Waste Water Treatment Directive

Ongoing National Initiatives

We will be addressing this issue, and investigating further ways to reduce eutrophication, through a new National Eutrophication Strategy (currently out for consultation). This document considers phosphates, nitrates, and diffuse and point source pollution.

3.0 ACTIVITY PLANS



Issue 4g Inadequate local sewerage in some villages results in localised pollution and may have public health implications

Traditionally, sewage treatment in rural areas has relied heavily upon individual septic tanks. Overflow from these tanks is designed to drain into the soil via a below-ground soakaway. In poorly drained areas with clay soils or high water tables, tanks were normally drained to the nearest watercourse. Where these ran through the centre of villages, pollution, smells and public health concerns, especially during periods of dry weather and low dilution flows, meant that the watercourses were piped-in and buried. The piped watercourse became known as the 'village drain' or the local council-maintained 'sewer'.

Current legislation allows applications to AWS for the provision of first time sewerage schemes, which are assessed against certain technical and economic criteria. Where this duty is found then there is an obligation on AWS to provide first time sewerage.

Applications have been accepted in the Plan area at Swaton, near Sleaford, and Whisby, near Lincoln and several other schemes are under consideration. Applications for Walcott, Fenton and Broadholme, Saxilby have been rejected but may be subject to appeal.

Objective		Improve inadequate local sewerage systems.								
Responsibility Lead	Action	00/01	01/02	02/03	03/04	04/05	Future	Cost (£k)	Comments	
Individuals Parish/District Councils	Apply for Water Industry Act 1991 Section 101A First Time Sewerage Connection.	*	*	*	*	*	*	NA		
AWS	Implement schemes where applications are approved: •Swaton, near Sleaford •Whisby, near Lincoln	*	*	*	*	*	*	NA	AWS are in control of the budgets and plans for proposed schemes. The dischargers are liable for connection and implementation costs.	
Agency	Arbitrate at the appeal stage where applications are refused.	*	*	*	*	*	*	R		
Individuals Parish/District Councils	Provide alternative arrangements where proposed schemes are rejected.	*	*	*	*	*	*	NA	Dischargers are responsible for costs and implementation.	
Agency	Take enforcement action to require provision of sewerage schemes where appropriate.	*	*	*	*	*	*	R		

3.0 ACTIVITY PLANS



Issue 4h Water quality in the River Witham, Hobhole Drain, Maud Foster Drain, and South Forty Foot Drain is affected by saline intrusion

During extended periods of low flow, salinity levels in a number of watercourses in the lower reaches of the Witham catchment rise. Freshwater fish have a limited ability to adapt to this increased salinity and migrate to upstream stretches. Fisheries may be compromised, with the loss of salt-intolerant species and dominance of salt-tolerant or brackish water species.

Moreover, when the change is too rapid, fish mortalities can occur, whilst algal *prymnesium* blooms may pose additional threats to fish life through their toxic releases. The flora of the watercourses is also affected. Excessive salinity is of additional concern to the agricultural industry, as the water may become unsuitable for spray irrigation.

The primary source of this salinity is leakage around and through tidal structures and sea banks, although salinity may also arise from "salt-pans". We have done much over the years to combat saline intrusion and minimise its impacts, including the use of pumps, bubble curtains and revised river management procedures.

Objective		Improve the quality of information needed to manage saline intrusion.									
Responsibility	Action	00/	01/	02/	03/	04/	Future	Cost (£k)	Comments		
		01	02	03	04	05					
Agency	Continue to monitor water quality in the Witham, Hobhole and South Forty Foot Drains.	*	*	*	*	*	*	R			
Agency	Monitor effectiveness of the pumps installed at Black Sluice which pump water back into the Witham Haven.	*	*	*	*	*	*	R			
Agency	Review the effectiveness of work already carried out on saline intrusion.		*					R	This will allow us to make further recommendations for the management of saline intrusion on a cost-beneficial basis.		
Agency	Implement recommendations of the above work.		*	*	*	*	*	TBE	These are dependent on the above review.		

3.0 ACTIVITY PLANS



Issue 4i Land contaminated as a result of past industrial practices causes water quality to fail the EC Dangerous Substances Directive

The EC Dangerous Substances Directive relates to pollution caused by certain substances discharged to the aquatic environment. It aims to protect the water environment by controlling discharges of harmful substances to rivers, estuaries and coastal waters.

The Directive refers to two types of compound. List 1 contains substances regarded as particularly dangerous as they are toxic, persist in the environment and bioaccumulate. Discharges containing List 1 substances, such as sheep-dip, pesticides, solvents, hydrocarbons, mercury, cadmium and cyanide, are controlled through Environmental Quality Standards (EQSs) contained in subsequent EC Directives. List 2 substances, such as heavy metals, ammonia and phosphorus, are considered less dangerous, but can nonetheless have a harmful effect on the water environment.

We are responsible for authorising, limiting and monitoring dangerous substances in discharges. We are also responsible for monitoring the quality of waters which receive discharges containing dangerous substances, and reporting the results to the DETR, who decide whether the standards in the Directive have been met. Where standards are not met, we are responsible for identifying the sources of pollution and for making sure that improvements are made.

Water quality in two watercourses in the LEAP area intermittently fails the EC Dangerous Substance Directives standard as a result of past industrial practices:

DIELDRIN IN THE NORTH DELPH

The North Delph in Lincoln (downstream of Allenby Road Industrial Estate) intermittently fails the Directive limit for dieldrin, a persistent organochlorine compound used in the formulation of insecticide powder on the industrial estate, but withdrawn from use in 1989. The owner of the land thought to be the source of this residual contamination has already undertaken significant works to remediate and prevent any further contamination.

DIELDRIN IN THE TOWNS DRAIN

The Towns Drain in Boston has been contaminated by dieldrin associated with a local timber treatment and storage site (Calders & Grandage) as wood preservatives have leached into the ground and migrated. Extensive remediation works carried out by Calders & Grandage include pollution minimisation, site clean-up and provision of a surface water treatment plant. Although some contamination remains, considered to be from slow release from the ground and sediments, surface water quality has improved dramatically following the remediation works. The concentration of lindane (gamma HCH), which previously failed to meet the standard, is now also compliant.

Objective Identify the source of dieldrin within the North Delph surface water sewerage system on the Allenby Road Industrial Estate.										
Responsibility		Action	00/	01/	02/	03/	04/	Future	Cost (£k)	Comments
Lead	Other		01	02	03	04	05			
Agency		Develop an investigation project.	*						5	
Agency		Implement the recommendations of the above project, which may include remediation works.		*	*	*	*	*	TBE	These are dependent on the above investigation.
Objective Identify any additional inputs of dieldrin to the Towns Drain.										
Responsibility		Action	00/	01/	02/	03/	04/	Future	Cost (£k)	Comments
Lead	Other		01	02	03	04	05			
Agency	Occupier	Undertake surveys in liaison with site occupier and treat on site as necessary.	*	*	*	*	*	*	2 p.a.	Costs of continued treatment will be borne by the occupier.
Agency		Continue to monitor for compliance with EC Dangerous Substances Directive.	*	*	*	*	*	*	2 p.a.	

3.0 ACTIVITY PLANS

5 Conserving the LAND

Agency Operational and Strategic Actions are to:

- influence the Town and Country Planning Systems to prevent inappropriate developments in areas at risk of flooding and increasing flood risk elsewhere;
- implement the Flood and Coastal Defence policy as advised by MAFF and the Welsh Office;
- secure an adequate level of investment in flood defence;
- provide flood plain surveys to local planning authorities;
- discourage inappropriate development in flood plains;
- work with nature to reduce coastal flooding;
- develop new methods to survey and manage flood defences;
- report regularly on the state of flood defences;
- identify the state and extent of the problem of soil erosion;
- develop a soil erosion alleviation strategy, including guidance on best practice;
- work with local authorities to identify, and report on the extent of, contaminated land;
- regulate identified 'special' contaminated land sites effectively;
- research into the specific risks and remediation needs of contaminated land;
- measure the effectiveness of steps taken to reduce nitrates in designated nitrate vulnerable zones; and
- develop methods for monitoring the 'state' and quality of soil with respect to its potential pollution.



Issue 5a The level of protection provided by, and the condition of, existing flood defences on the Witham Haven are being reduced by rising sea levels and bank erosion

Sea levels relative to land levels along the Lincolnshire coastline are rising at an estimated 6mm per year. Cumulatively, this could lead to a 210mm rise in levels by 2030. The current defences at Boston provide a level of protection for a 1 in 100-year tide event¹ with sufficient freeboard to allow for this predicted rise in levels. Raising the defences still higher in the early part of the 21st century will, however, have to be considered in the light of predicted climate change and sea-level rise.

A mixture of steel piling and brick/concrete walls lines the tidal channel through Boston. Some of these support important flood defences and are maintained by us, but others do not form part of the flood defences and are owned privately. Their condition varies and certain lengths of wall require maintenance.

A condition survey of the walls in Boston, completed in June 1996, has already led to grouting works at Edwin Street to prevent seepage and the ultimate undermining of the wall; repairs to the brickwork at South Quay; and piling work along South Terrace.

In the more immediate future, the Haven channel, which is subjected to tides, wave action and boat wash, is being eroded. This could undermine the stability of the defences. A review of the River Witham Outfall Stoning Strategy, completed in May 1996, led to the close monitoring of the Haven for signs of erosion on a six-monthly basis. As yet, this has not revealed any significant problems but repairs to the stone revetment system are required most years due to erosion and the effects of boatwash caused by traffic on the Haven.

¹The 1:100 year standard means that the likelihood of such a flood level being exceeded has only a 1% risk of occurring in any one year.

3.0 ACTIVITY PLANS

Objective

Maintain standards of flood defence along the tidal Witham.

Responsibility Lead	Other	Action	00/01	01/02	02/03	03/04	04/05	Future	Cost (£k)	Comments
Agency	MAFF	Carry out stone revetment works.	*	*	*	*	*	*	30 p.a.	These are carried out as and when necessary.
Agency		Undertake a periodic review of flood defence standards and the condition of the flood defences.					*		10	
Agency		Carry out surveys to monitor the above.	*	*	*	*	*	*	6p.a.	

MAFF - Ministry of Agriculture, Fisheries and Food



Boating on the Witham Haven

3.0 ACTIVITY PLANS



Issue 5b Flood defences along the Lower Witham and its tributaries do not meet their target standards

Flood defence standards for some lengths of the Lower Witham and its major tributaries between Lincoln and Boston fall below our Standards of Service targets (Map 2). This is partly due to recent high flows and changes in catchment characteristics.

A Strategic Study published by the Agency in 1997 recommended a required minimum level of service throughout the catchment. Urgent or emergency works were however undertaken where necessary, ahead of implementing the full strategy. These included the anti-seepage and embankment stabilisation works completed at sites on the Lower Witham at Bardney and Blankney Fen, and downstream of Five Mile Bridge. However some deficiencies remain:

The Witham – Downstream of Lincoln (Stamp End Lock) the current flood defences fall below the indicative standards defined by MAFF and ourselves.

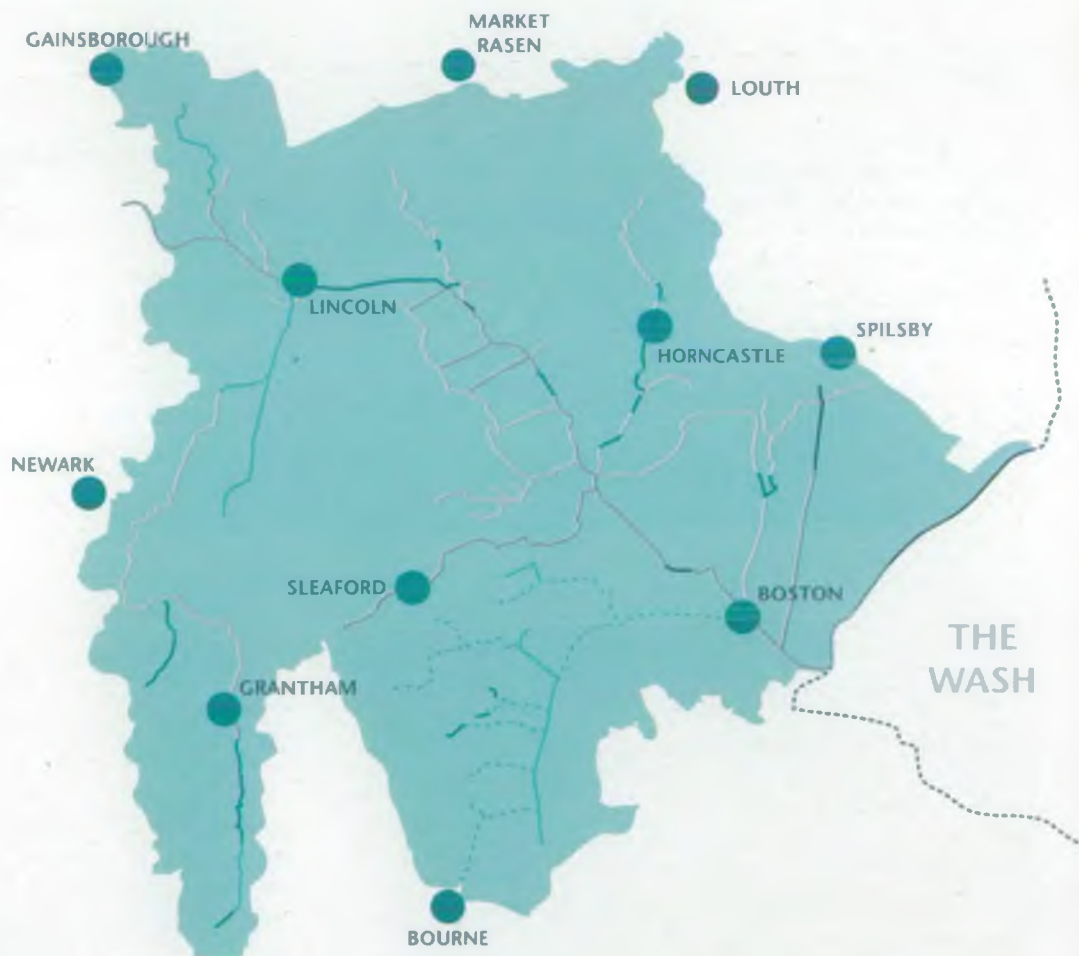
Barlings Eau – This watercourse has experienced embankment breaches and flooding during past high flow events.

The River Bain – Standards of defence in and downstream of Horncastle currently fall below indicative standards, especially in the villages of Haltham and Kirkby-on-Bain. Improvement works here are particularly important as Horncastle is at risk from a number of sources during periods of high flow and rainfall: if the Bain and Waring are running at a high level, IDB and surface water outfalls cannot discharge. These then back up and flood areas away from the Main River.

Map 2

Standards of Flood Protection
(Return Period in Years)

Tidal	Fluvial
150 - 199	> 100
50 - 149	51 - 100
20 - 49	21 - 50
5 - 19	11 - 20
< 5	< 10
-	Uncertain



3.0 ACTIVITY PLANS

Objective Provide effective flood defences on the Lower Witham and its tributaries.											
Responsibility		Action	00/	01/	02/	03/	04/	Future	Cost (£k)	Comments	
Lead	Other		01	02	03	04	05				
Agency	MAFF	Develop and progress the Lower Witham Flood Defence Strategy.	*	*	*	*	*		1m	MAFF and the Treasury have now approved the Strategy. We are assessing the appropriate standards of defence in the river valley and associated unconfined flood areas. A programme of works was due to commence in April 2000, subject to financial approval.	
Agency	MAFF	Barlings Eau: Carry out bank raising and strengthen 600m of the right hand bank.	*	*	*	*	*		As above	Works are included in the Lower Witham Defence Strategy.	
Agency	MAFF	Carry out further bank stabilisation works where necessary: River Witham upstream of Five Mile Bridge. River Witham upstream of Bardney Lock.	*	*	*	*	*	*	400	These will help to ensure a minimum level of service throughout the catchment.	
Agency	MAFF	Develop and progress the Horncastle Flood Relief Strategy.		*	*	*	*	*	2m	MAFF and the Treasury have now approved the Strategy. Works are due to begin in 2001, with the preferred options of creating storage areas upstream of Horncastle, and village protection banks at Haltham and Kirkby-on-Bain.	



Issue 5c Standards of flood protection along the Upper Witham at Grantham and the South Forty Foot Drain do not meet target standards

The Upper Witham through Grantham and the South Forty Foot Drain and its tributaries have benefited from major capital schemes in the past. During the last 20 to 30 years, however, the standard of defence provided by the channel and its structures may have deteriorated.

Whilst we carry out regular maintenance inspections, surveys and works, certain reaches of the Upper Witham and South Forty Foot Drain catchments do not currently receive a standard of flood protection that meets indicative target standards. We do not presently hold sufficient and detailed hydraulic information on the catchment or its structures to establish current performances or standards of service.

(I) THE UPPER WITHAM AT GRANTHAM

This area last received the benefits of a major improvement scheme in the 1970s. The last scheme was designed to provide defence against a 1 in 30 year event, but the current indicative standard of defence for an urban area such as Grantham is 1 in

100 year. Whilst it should be possible to carry such flows through the town, the channel and structures are not designed to do so. The impacts of development within the area (Issue 5g) and the condition of the defences also need to be defined.

(II) THE SOUTH FORTY FOOT DRAIN

This watercourse and its tributaries serve a large fen subcatchment south and west of Boston. The Black Sluice Pumping Station, which discharges flood waters from the system by pumps and gravity outfall, is nearing the end of its design life. Since Christmas 1997 a number of the tributary highland carriers have experienced out of bank flow. The most recent of these was in March 1999, when there was a breach of the South Forty Foot Drain itself. Consultants are undertaking a review of the condition of the defences on behalf of the Agency and this will lead to a strategic study which examines the options for improvement and a hydraulic model to assess the effects on the relevant watercourses. Topographic surveys and geotechnical investigations are now complete.

After flooding originating from the Billingborough Ouse Mere Lode (one of the tributaries of the South Forty Foot Drain) a separate investigation has begun to determine options to alleviate future flooding or high flows.

3.0 ACTIVITY PLANS

Objective		Provide and maintain effective flood defences along the Upper Witham at Grantham and the South Forty Foot Drain.								
Responsibility Lead	Other	Action	00/01	01/02	02/03	03/04	04/05	Future	Cost (£k)	Comments
Agency	MAFF	Develop the Black Sluice Strategy Study.	*						TBE	The strategy is due to report in early 2001.
Agency	MAFF	Implement the recommendations of the above.	*	*	*	*	*	*	TBE	Works are scheduled to begin in December 2000. Details are dependent on the results of the above study.
Agency	MAFF	Undertake urgent remedial works where seepage is identified as a potential threat to defences.	*	*					TBE	These are carried out as part of our Revenue Programme.
Agency	MAFF	Review the need to improve standards of flood defence along the Upper Witham at Grantham.						*	R	



Issue 5d Shared responsibility for maintaining the embanked Fossdyke Canal poses a potential risk to the Fossdyke Canal flood defences

The ownership of or responsibility for structures on the Fossdyke Canal has become confused over the years. Although this has largely been resolved, some uncertainty remains regarding responsibility for the maintenance of the embanked canal. This could delay maintenance work, which could in turn increase flood risk. Problems with structures may require several parties to become involved, each with varying degrees of responsibility.

We have carried out a condition survey of the structures that "contain" the Fossdyke, and have found that none of the structures under our jurisdiction require urgent attention. The raised embankments are maintained by the Agency regardless of who is responsible for the revetment, and we aim to ensure that there is no danger of failure caused by neglect on the Agency's part.

However, unless this issue is resolved, the position will remain confused. This may lead to defence failure and urgent/emergency repair work.

Objective		Reduce the potential risk to the Fossdyke Canal flood defences as a result of shared responsibility for maintaining the embanked canal.								
Responsibility Lead	Other	Action	00/01	01/02	02/03	03/04	04/05	Future	Cost (£k)	Comments
Agency BW	DETR Lincoln CC Railtrack LCC	Promote agreement with all parties having responsibilities for the Fossdyke Canal.	*	*	*	*	*	*	R	British Waterways' legal team is currently considering a maintenance agreement.

Objective		Maintain Agency-owned structures and defences.								
Responsibility Lead	Other	Action	00/01	01/02	02/03	03/04	04/05	Future	Cost (£k)	Comments
Agency		Carry out regular inspections.	*						10	Inspections are carried out on a 5-yearly basis.

BW - British Waterways CC - City Council LCC - Lincolnshire County Council DETR - Department of the Environment, Transport and Regions



Issue 5e At certain locations in the Plan area our flood warning target of two hours is not being met

We aim to provide advance warning of flooding where it is known to have occurred in the past and where it is physically possible to do so. This warning may not be specific to a particular street or property, and normally applies to a wider area. Whilst warning cannot prevent flooding itself, it may alleviate the damage caused by allowing those affected more time to prepare.

The role of the Agency with respect to flood warning and forecasting is:

- to monitor rainfall, river and tidal conditions;
- to forecast and monitor floods;
- to interpret the impact of floods; and
- to take reasonable steps to alert those at risk.

In order to fulfil this role, the Agency must ensure that there are:

- accurate and reliable hydrometric data on rainfall and river flows;
- accurate and reliable forecasts of flood flows and levels;
- clear assessments of flood defence standards, flooding thresholds and flood risk areas;
- effective flood warning dissemination systems;
- methods to alert and warn the public when there is a risk of flooding, such as Automated Voice Messaging;
- flood warning plans and associated public information to ensure the public are aware of flood risks; and
- flood warning arrangements.

A number of high flow events in the catchment over the past 2 years have resulted in some out-of-banks flow and flooding. Our ability to give our stated target warning of at least 2 hours, however, is often difficult. This is because the upland reaches of the catchment respond quickly to heavy rainfall, especially when the soil is already saturated from previous rain or snowfalls. Many localised events only last 2-3 hours as the peak flow passes quickly through the system.

We reviewed and developed our flood warning thresholds and procedures in 1999 and will be carrying out further improvements our flood warning service over the next two years. The Anglian Region Telemetry System (ARTS) aims to rectify any inadequacies in the region's telemetry capability, particularly in terms of flood warning and flood control. ARTS Phase 1 overhauled many previously existing telemetry outstations and provided new communication and computing systems onto which subsequent improvements could be built. Phase 2 includes the development of the Anglian Flow Forecast Modelling System. Pilot modelling of the River Witham has already included detailed catchment simulation and data collection.

ARTS 3 includes the construction of additional telemetry outstations to monitor river levels and sluice status, whilst ARTS 4 will provide additional flow gauging sites throughout the Region.

3.0 ACTIVITY PLANS

Objective Provide an appropriate standard of flood warning.											
Responsibility		Action	00/01	01/02	02/03	03/04	04/05	Future	Cost (£k)	Comments	
Lead	Other										
Agency		Commission the improved river flow gauging sites in the Plan area.	*						R	This will be carried out at the following sites where improvement works have been completed: Till Washlands Hykeham Bridge Fosssdyke Langworth Stainfield Victoria Mill (River Bain) River Waring	
Agency		Complete improvement works at Beckingham Road Bridge gauging station and commission the site.	*						R		
Agency		Improve flow forecasting models.	*						R		Work is continuing.
Agency		Produce Section 105 flood risk maps for use by the Agency and the emergency services.	*						R		Maps are now being produced identifying the areas where we should be looking to improve or extend our flood warning service.
Agency		Improve/adjust flood warning and dissemination plans.	*						R		New Local Flood Warning Plans are to be published on 12/9/2000, replacing our Flood Warning Dissemination arrangements.

Ongoing National Initiatives

A number of ongoing national initiatives are relevant to this issue:

- to review the Agency's policy on flood warning dissemination;
- to review the effectiveness of the Agency's flood warning methods;
- to improve inter-agency co-ordination of emergency flood planning;
- to review technical developments to enhance flood forecasting and warning; and
- to review/implement the recommendations of the independent review of the Easter floods.

A major public awareness campaign was launched across England and Wales in October 1999. The first phase of the campaign focuses on raising awareness of flood risk and self-help measures to reduce flood damage. The launch of Floodline, a new telephone service from the Agency in partnership with BT, is at the heart of the campaign (0845 988 1188). Floodline is designed to make it easier for the public to know whom to contact about flooding issues.

Subsequent phases during 2000 and beyond will repeat and reinforce the basic messages and introduce new and additional information as appropriate, such as flood warning codes, and improve public understanding.

The Agency has also published an Action Plan for England and Wales, based upon the recommendations of an independent review.

Other associated actions to improve the management of flood events will include:

- clarifying and developing operational procedures and responsibilities with other organisations;
- reviewing the system of river patrols and field condition monitoring;
- simplifying and improving Agency flood warning procedures;
- reviewing the Anglian Region Telemetry System (ARTS);
- reviewing Flood Warning dissemination (5 year Plan); and
- reviewing the programme to produce Section 105* flood risk maps.

*Section 105 of the Water Resources Act 1991 allows for Standards of Service, Assets and Flood Risk surveys.

3.0 ACTIVITY PLANS



Issue 5f Locally, inadequately maintained riparian drainage systems give rise to land drainage problems

Localised flooding of riparian watercourses in the Plan area occurs due to insufficient maintenance, inappropriate culverting and the insufficient capacity of watercourses to accommodate increases in surface water run-off following development.

As a result of the Easter 1998 flood, an independent review team presented a report to the Board of the Agency in September 1998. This stated that *"the Agency should give greater attention to its general*

supervision and enforcement roles" as the *"correction of deficient works in the ownership of others and action to restore ordinary watercourses to proper condition may have resulted in less damaging flooding."*

Ultimately, however, responsibility lies with riparian owners. Local authorities have powers to resolve this issue, for example East Lindsey District Council have promoted a scheme to reduce localised flooding at Minting. All the works at Minting carried out under the original scheme are now complete and are maintained by East Lindsey district Council. However, in general local authorities are increasingly reluctant to do this because of resource implications and/or lack of expertise.

Objective Ensure riparian-owned drainage systems are operated and maintained to enable effective operations.										
Responsibility		Action	00/ 01	01/ 02	02/ 03	03/ 04	04/ 05	Future	Cost (£k)	Comments
Lead	Other									
Agency	LAs	Enforce the Land Drainage Act 1991 and Water Resources Act 1991.	*	*	*	*	*	*	40	
Agency		Exercise and maintain the Agency's supervisory role.	*	*	*	*	*	*	R	



Issue 5g There is concern that development within the catchment may be contributing to increased flood risk in Lincoln and Grantham

The natural flow of rivers and watercourses following periods of heavy rainfall depends on a range of factors, including groundwater inputs, the rate at which surface water runs off the land, and the gradient and form of the river channel itself. Urbanisation (which increases the area of impervious land) and improved drainage systems accelerate the rate at which rainwater reaches a watercourse, thus raising peak river levels. Changes in agricultural land use (e.g. the conversion of pasture to arable land) can also reduce the land's ability to buffer surface water run-off, with similar effects.

The past 20 years have seen significant development within the catchment, most notably in the urban areas of Lincoln and Grantham. The implications of this development for river flows are not fully understood.

Some of the blame for the Easter 1998 flood event in Northampton was attributed to urban development. There is also concern over the potential impacts of future development elsewhere. The independent report into the Easter 1998 flooding reflected this, suggesting that *"the long term risks of development policies in the floodplain and the effectiveness of operation of mitigating works must be reviewed in the light of the Easter flood"*. The Draft Planning Policy Guidance Note 25 on Development and Flood Risk emphasises the need for a precautionary approach to development in flood risk areas in accordance with the principles of sustainable development and the likely impacts of climate change.

The Agency asks developers to mitigate against any increase in surface water run-off and lost flood storage capacity their schemes might increase, by providing measures to maintain a balance. Wherever possible we wish to reduce flood risk to people and property whilst providing a positive gain for the natural environment when development proposals are considered, leading to the restoration of floodplain and generally working with nature rather than against it.

3.0 ACTIVITY PLANS

We nonetheless have limited control over the way in which land is developed – the control of land-use change is primarily the responsibility of the local planning authorities under town and country planning legislation. We are however a Statutory Consultee in the planning process and make both planning authorities and developers aware of flood risks in a specific area, consequent constraints on development, and any ways in which these may be overcome. The local planning authorities prepare statutory development plans that outline policies to guide future development. We provide advice during the formulation of these policies in order to mitigate environmental impacts.

Objective Improve our understanding of flood risk in the catchment and reduce those risks where appropriate										
Responsibility		Action	00/	01/	02/	03/	04/	Future	Cost (£k)	Comments
Lead	Other		01	02	03	04	05			
Agency		Complete a strategic reassessment of flood risk and development for: Lincoln. Grantham.	*	*					10 10	
		Consider the recommendations of any findings.						*	TBE	
Objective Reduce the potential risk of flooding which can be caused by future development										
Responsibility		Action	00/	01/	02/	03/	04/	Future	Cost (£k)	Comments
Lead	Other		01	02	03	04	05			
Agency		Deliver Section 105 flood risk maps to local authorities.	*						400	These maps are intended for use by local authorities to enable them to direct development away from areas most at risk of flooding.
Agency	LA	Consider a review of development strategies with all planning authorities.	*	*	*	*	*	*	R	The Agency and planning authorities will have to consider carefully and take on board those policies/ recommendations relating to PPG 25
LA	Agency	Review relevant local plans.	*	*	*			*	R	It is anticipated that most local authorities will review their Development Plans in the next 2 years
County Councils	Agency	Review relevant structure plans.	*	*	*	*	*	*	R	Adoption of the Structure Plan is imminent

3.0 ACTIVITY PLANS

6 Managing WASTE

Agency Operational and Strategic Actions are to:

- provide a high quality waste regulation service;
- develop an overall database of waste arisings and disposals;
- measure the effectiveness of taxation to reduce waste and to encourage its re-use and recycling;
- obtain information on fly-tipping and devise means of combating it;
- implement the 'producer responsibility' regulations;
- develop life-cycle assessment methodologies for dealing with waste;
- encourage and inspire industry to develop new and improved techniques for the management of special and other industrial wastes;
- encourage and ensure achievement of national waste strategy targets for the reduction of waste disposed of to landfill;
- encourage and ensure achievement of national targets for the recovery, recycling and composting of municipal waste;
- combat organised crime, at national and international level, involving the illegal trading in waste;
- research into the technical needs of successful waste management, including best practice and best practicable environmental options;
- secure high quality management of radioactive waste in industry;
- ensure that any proposals for solid radioactive waste disposal will provide the necessary high level of protection for man and the environment; and
- commission research into the potential effects of wastes entering the environment, including the potential effects of radioactive wastes.



Issue 6a Storage of tyres at Normanton airfield poses a potential risk to the environment and harm to human health

Each year, some 37 million tyres weighing 380,000 tonnes are discarded in the UK. The number of tyres in use is forecast to increase by as much as 60% by the year 2021. A proposed EC Directive on landfill management is meanwhile likely to ban the landfilling of whole tyres by 2003, and that of shredded tyres by 2006. Rising disposal costs also mean that metal recyclers are reluctant to accept tyres as part of the general scrap stream. Alternative disposal options include retreading, burning to produce energy, and crumbing to produce road and playing surfaces. Retreading is, however, reportedly in decline and the number crumbed represents only 10% of the total.

As a result, waste producers stockpile their used tyres, or vast numbers are illegally disposed of, and we are concerned that illegal tyre dumping may increase. There is a real risk that these stockpiles will catch fire, releasing black smoke, volatile organic compounds, dioxins and polycyclic aromatic hydrocarbons to the atmosphere. Phenols, polycyclic aromatic hydrocarbons and

metals can also leach into groundwaters and rivers. The tyre dumps themselves are eyesores that preclude beneficial land-use.

In September 1997 we became aware of a large tyre dump at Normanton Airfield, believed to have been started by the RAF over 30 years ago. Since they left, the site has received tyres from a number of sources and now contains more than 50,000 tyres. Normanton Airfield is located on a minor aquifer and, like many airfields, probably has extensive unmapped drainage, in this case leading to the Ease Drain, a tributary of the River Witham at Long Bennington. This poses an acute potential risk to the environment, and to surface water in particular, in addition to the risks normally associated with such stockpiles.

In recent meetings with the landowner, the Roseland Group Ltd, it was agreed that no more tyres would be accepted and that the dump would be dispersed over time. Some tyres have been used to build a safety barrier around a skid patch and a contractor has removed others for recycling. This has, however, made little impact on the overall number and other opportunities are being reviewed as they arise. In the interim, the landowner is to submit an application for a waste management licence that addresses our environmental concerns.

3.0 ACTIVITY PLANS

We have also been involved in developing a contingency plan, in conjunction with the landowner and fire service, for use in the event of emergency on-site. We will continue to be involved in reviewing the arrangements for the emergency plan.

Objective Seek regulatory compliance for storage facilities.										
Responsibility		Action	00/	01/	02/	03/	04/	Future	Cost (£k)	Comments
Lead	Other		01	02	03	04	05			
Land-owner		Apply for Waste Management Licence for tyre storage.	*						NA	This will involve the application costs to the landowner.
Objective Ensure that proactive pollution prevention measures are adhered to.										
Responsibility		Action	00/	01/	02/	03/	04/	Future	Cost (£k)	Comments
Lead	Other		01	02	03	04	05			
Agency		Issue Waste Management Licence.	*		*				2	In principle, costs will be covered by company application and subsistence fees.
Agency		Inspect storage facilities on a routine basis.	*	*	*	*	*	*	2	
Objective Reduce the risks associated with tyre storage.										
Responsibility		Action	00/	01/	02/	03/	04/	Future	Cost (£k)	Comments
Lead	Other		01	02	03	04	05			
Land-owner		Remove tyres over time.	*	*	*	*	*	*	NA	Costs will be incurred by the landowner. This will take place as opportunities arise.

3.0 ACTIVITY PLANS

7 Addressing CLIMATE CHANGE

Agency Operational and Strategic Actions are to:

- help to ensure that the Government's greenhouse gas emission reduction targets are met;
- develop methods to improve our estimates of the emission of methane into the atmosphere from landfill sites;
- encourage the use of methane generated by landfilled waste for electricity production;
- promote tax incentives to reduce energy production from burning fossil fuels;
- set an example by reducing our own energy and fossil fuel consumption;
- invest in research to predict the likely effects of climate change on the environment of England & Wales, and how to manage them;
- provide improved mapping of low lying coastal areas at risk from sea level changes;
- develop techniques to identify changes in plant life, using remote sensing techniques, to measure the effects of different weather patterns in sensitive areas; and
- contribute our knowledge and expertise to national and international forums dealing with climate change.



Issue 7a Methane emissions from landfill sites in the catchment harm the environment

We are responsible for regulating the treatment, storage and disposal of wastes arising from industrial, household and commercial activities. Nationally, 70% of this is landfilled. The biodegradation of organic matter produces landfill gas which consists of methane (typically 64%) and carbon dioxide (34%), as well as a wide variety of trace components including mercaptans which are unpleasant to smell and, sometimes, hydrogen sulphide which is extremely hazardous. In confined spaces, the gas poses asphyxiation hazards, whilst migration off-site through substrata can lead to the risk of explosion in nearby properties and crop damage. Release into the air can produce odours and atmospheric damage.

The Agency document *The Environment of England and Wales – A Snapshot* meanwhile indicates that waste treatment and disposal, including landfill, contributes about one third of the UK's total methane emissions to the atmosphere. Methane is a greenhouse gas that traps heat in the atmosphere, with a global warming potential 24 times higher than that of carbon dioxide. Electricity companies are now required by order to make arrangements to secure the availability of a specified amount of capacity from non fossil-fuel power stations (the Non-Fossil Fuel Obligation or NFFO⁵).

We encourage operators to collect and utilise methane for electricity generation. Six active landfill sites in the catchment receive household, industrial and commercial waste (Colsterworth, Leadenham, Whisby, North Hykeham, Kirkby-on-Bain and Boston) and all of these sites have provisions to vent landfill gas, reducing the potential for its migration. Flaring and electricity generation schemes which also combat any identified problems with odours are in the active, appraisal, or research stages and the site at Boston has been producing electricity by this means since 1998. The status of other individual landfills is shown in the table below.

LANDFILL	NFFO BID ACCEPTED	ACTIVE VENTING	ELECTRICITY GENERATION
Whisby	✓	✓	✓
North Hykeham	✓	✓	2000
Colsterworth	✓	✓	2000
Kenwick	✓	✓	2001
Leadenham	✓	✓	2001

⁵ A requirement on regional electricity companies in England and Wales to purchase from specified producers, at a premium price, for a fixed period, specified amounts of electricity generated by methods other than burning fossil fuels.

3.0 ACTIVITY PLANS

Where research into the potential for gas utilisation, and thus income from selling electricity, has been proven, it is in the interests of the operator to progress. At Kirkby-on-Bain, we will consider requiring the provision of active collection and flaring under the terms of the Waste Management Licence in the course of general licence reviews.

Objective		Reduce emissions of methane from landfill sites.								
Responsibility Lead	Other	Action	00/01	01/02	02/03	03/04	04/05	Future	Cost (£k)	Comments
Operator	Agency	Active venting with utilisation of gas and modification of working plan.	*	*	*	*	*	*	NA	The status of individual sites is described above. Costs will be borne by the site operator. Modification will usually be carried out in the normal course of a licence review.
Agency		Provide advice and review the proposals made.	*	*	*	*	*	*	3 per site	
Agency		Kirkby-on-Bain Modify licences to require flaring.		*	*	*	*	*	3	
Agency		Continue to monitor methane emissions from landfill sites.	*	*	*	*	*	*	1	

3.0 ACTIVITY PLANS

Other environmental concerns in the Plan area for which we have not identified any specific issues involve the regulation of major industry and improving air quality.

8 Regulating MAJOR INDUSTRIES

Agency Operational and Strategic Actions are to:

- continue the efficient and effective delivery of Integrated Pollution Control;
- implement the requirements of the EC Directive on Integrated Pollution Prevention and Control;
- implement the relevant requirements of the Control of Major Accident Hazards Directive;
- develop practical working relationships with fellow regulators, particularly the Health and Safety Executive;
- develop pollution prevention control tools including projects relating regulation to emission, efficiency and economic benefits;
- encourage the use by industry of BS 7750/ ISO 14001 accreditation;
- encourage registration under the EU Eco-Management and Audit regulations;
- pay special attention to the needs of small and medium-sized enterprises;
- maintain and expand the Chemical Release Inventory;
- introduce Operator and Pollution Risk Appraisal;
- play a full and active part in the EU Network for the Implementation and Enforcement of Environmental Law;
- ensure that radioactive releases from nuclear sites which result in exposures to individual members of the public are well within accepted limits;
- ensure that the total potential impact of releases from nuclear sites are environmentally acceptable;
- develop and implement toxicity based consenting methods for releases from complex industrial sites;
- ensure improvements are made to the quality of discharges to estuarine and coastal waters;
- implement the requirements of the EC Urban Waste Water Treatment Directive;
- research into effective means of ensuring that disinfectant and sterilisation techniques are safe for the environment; and
- develop and implement tools to assess risks, costs, benefits and options in relation to the major industrial pressures on the environment.

The Witham LEAP area is predominantly rural, and no specific issues have been raised regarding the regulation of major industries. We will however continue to protect the environment by regulating large, technically complex and potentially polluting industries, and have regard to the government's National Air Quality Strategy when setting standards for releases to air from industrial processes.

3.0 ACTIVITY PLANS

9 Improving AIR QUALITY

Agency Operational and Strategic Actions are to:

- help the Government deliver its Air Quality Strategy;
- ensure emissions from the major industrial processes to the atmosphere are reduced;
- ensure specific emissions of sulphur dioxide and oxides of nitrogen, which contribute to acid rain, are reduced;
- discourage the use of solvents in industry, which contribute to the production of ozone, the major photochemical pollutant; and
- set an example in reducing emissions from vehicles by reducing our own mileage and increasing the use of public transport.

The UK National Air Quality Strategy, the first of its kind in Europe, was published in March 1997. This fulfilled the requirements for national air quality under the Environment Act 1995, which extended the responsibilities of local authorities to monitor air quality in their areas and, where necessary, to draw up air quality management plans to mitigate against breaches of air quality standards. The Government endorsed the Strategy in July 1997 on the basis that it would be implemented in full but reviewed at the earliest opportunity.

Following consultation, the Government intends to produce a revised version of the National Air Quality Strategy based on clear standards and targets, which will itself be subject to consultation before it is finalised. It will be supported by a framework for local air quality management which will:

- require periodic review of air quality by all local authorities;
- provide for the establishment of Air Quality Management Areas in those places where air quality targets are unlikely to be met;
- place powers and obligations on local authorities and other relevant bodies to prepare plans for remedying air quality problems; and
- secure the effective co-ordination of all activities which can influence air quality improvement in the most cost-effective manner and in those areas where it is most needed.

This may include traffic management planning in conjunction with the regulation of prescribed Part A and Part B processes. We regulate Part A processes (those prescribed for Integrated Pollution Control (IPC) which have the greatest potential for serious environmental pollution). Part B processes, regulated under the local authority air pollution control system, have less serious potential to pollute. We will be required to participate in the setting and achievement of such local standards and we are working closely with local authorities to manage air quality in the Plan area. Locally there are very few processes which impact on air quality, and the greatest stress on air quality is from road traffic.

3.0 ACTIVITY PLANS

3.2 Wash LEAP Issues

A number of Issues in our Wash LEAP have implications for the Witham LEAP area:

Siltation of the River Witham Outfall into the Wash

Siltation occurs along the tidal length of the River Witham, including at its outfall to the Wash. This is due to the accretion of sediments both from marine sources within the Wash, and from sediments within the River itself. The build-up of material adversely affects the flood discharge capability of the tidal river and its navigation.

Low fluvial flows, especially during dry periods, are unable to keep the tidal channels clear of the sediment build-up. Internal Drainage Board gravity outfalls and sluices are also affected. Part 1 of our Wash Rivers Outfall Strategy (WROSS) considered the extent of this problem on the River Witham and identified a range of actions appropriate to resolving it. We are also maintaining existing revetments on the Witham Haven. The Port Authorities carry out a programme of dredging on the navigation channels, whilst we clear silt at tidal sluices and land drainage outfalls, and remove sediment from channel banks.

Flood Defence Standards

Many of the existing coastal defences in the LEAP area were built following the 1953 flood event, and were rebuilt and raised as a result of the subsequent 1978 event. Some of the defences were however unimproved and are approaching the end of their effective life. Along with predicted sea-level rise, this is gradually lowering flood defence standards and increasing flood risk.

A strategy is being carried out to improve the standards of flood defence between the Hobhole Outfall and Freiston Shore, which protect the Boston area, from a 1 in 20 to a 1 in 200 year standard. Over recent winters this frontage has been the cause for concern following damage from storm tides. The proposed work is the most economic solution to improve the standards of flood defence. Approximately 60 hectares of agricultural land has been identified for managed re-alignment. The building of new defences and creation of a large area of saltmarsh will provide an effective system by which wave energy is absorbed.

The initiative at Freiston Shore will also create valuable saltmarsh habitat forming an important part of the transition zone, which will be managed for conservation interest. The scheme is being progressed in conjunction with the Prison Service, English Nature and the RSPB. Jackson Civil Engineering was awarded the contract to carry out the works.

Works to raise and improve 8km of sea defence earth embankments, and construct 0.5km of new embankments between the Hobhole Outfall and Freiston Shore began in October 1999. The trial embankment was completed in December 1999, and this will determine the profile for the main bank raising work. Improvements involve raising the banks on the back face, thus avoiding impacts on the Special Protection Area. The majority of materials for construction are being won close to the site and transported via a haul road along the back of the bank, thus minimising disturbance to local roads.

Site clearance was also undertaken in March 2000, prior to the bird breeding season, and bank raising/strengthening work has commenced between the Hobhole Outfall and Butterwick Low. The main earthworks are due for completion by January 2001. Compensatory planting will also be carried out in certain areas.

We have also successfully secured Objective 5b European Funding, in conjunction with the RSPB, Lincolnshire Bird Club, Lincolnshire County Council and Boston Borough Council. This comes from the European Agricultural Guidance and Guarantee Fund (awarded for the economic regeneration of rural areas) and uses the Flood Defence Scheme as match funding. The funding will be used for a range of environmental and recreational enhancements which will allow for improved access and wetland creation, such as:

- new car parks;
- creation of a new conservation area;
- creation of two officer posts (attached to the RSPB);
- extensions to the existing RSPB reserve at Frampton; and
- improvements to local cycle routes and bird hides.

3.0 ACTIVITY PLANS

Possible presence and effects of persistent substances discharging to the Wash

The Witham LEAP area is predominantly rural and a variety of agrochemicals are used throughout the catchment. Many of these compounds are chemically stable, and consequently they may remain in the watercourses as they flow to the Wash. We monitor water quality throughout the catchment area in order to assess the quantities of such substances and their environmental effects. We also liaise with agricultural bodies with a view to minimising nutrient inputs to watercourses and improving standards of effluent treatment.

Concern over the possible eutrophication of the Wash

Past water quality investigations have identified significant elevations of nutrient content in the Wash. These nutrients may derive from, for example, agriculture (e.g. fertilisers) or sewage treatment works effluent. We are investigating the possibility that the Wash may be eutrophic as a result of these inputs, and we monitor watercourses in the Witham LEAP area in order to identify the sources of these nutrients. Once we have identified any specific problems we will be able to direct water quality initiatives in order to alleviate them.



4.0 A BETTER ENVIRONMENT THROUGH PARTNERSHIP

4.1 Introduction

The aim of this section is to highlight broader, long-term issues and to profile the types of partnership required to address them. Establishing close and responsive relationships with all sectors of the community is vital if we are to achieve a better environment for present and future generations.

Population and economic growth have increased the use of natural resources and waste production, whilst intensive farming, mineral extraction and urban development have impacted significantly on flora and fauna. Increasing demand for water to meet public and agricultural needs adds to these pressures.

Partnership basically involves a number of different interests willingly coming together, formally or informally, to achieve a common purpose. Partnerships are desirable because they provide accountability, reduce the duplication of work and allow the pooling of resources.

We are well placed to influence many of the activities affecting the environment through the Environment Act 1995 and other legislation. Our powers to deal with environmental concerns (Appendix 1) are, however, not comprehensive and in many areas we must work with others to protect the environment and minimise potential threats.

4.2 Environmental influences

Urban Development

Urban development can have a potentially adverse impact upon the environment, resulting in:

- (i) increased risk/occurrence of flooding as a consequence of changes to surface water drainage.
- (ii) increased risk to surface and groundwater quality from treated and untreated effluent discharges.
- (iii) increased pressure upon sewerage infrastructure.
- (iv) increased demand for water from industry and the public.
- (v) loss of habitat due to land take.
- (vi) increased waste production.
- (vii) risk to air quality.

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

Responsibility for regulating changes in land-use lies with local planning authorities. The development plan process sets out the framework for land use change and the implementation of development control. Local councils then decide on the location of new development, the redevelopment of existing areas and changes of land- or building-use. We liaise closely with planning authorities in our role as a consultee, along with developers, and advise on proposals relevant to the Agency. We will also continue to liaise with planning authorities in the development of air quality strategies and, where appropriate, Local Air Quality Management Plans.

The mounting evidence supporting the theories of climate change and sea level rise, and the publication of the Draft Policy Planning Guidance (PPG) 25, have heightened the awareness of the Agency and local authorities of the need for greater consideration of development and flood risk within local plans. A key issue is the debate over the sustainability and suitability, in the long term (50-150 years), of development at risk of flooding from both tidal and fluvial sources. Close cooperation between the Agency and local authorities will be required over the coming months and beyond to ensure these matters are properly addressed.

The Agency is also responsible for regulating the treatment, storage and disposal of industrial, household and commercial wastes. Nationwide, 70% of this is landfilled. Regardless of how well landfill sites are located and engineered, they still have the potential to pollute surface and groundwaters, soil and air. The adoption of the Landfill Directive in April 1999 means that it must be transposed into law by July 2001, leading to the progressive diversion of biodegradable waste from landfill. The Directive should result in a major shift in the way in which we approach the management of waste. Landfill will be reduced in favour of recycling, and incineration (with energy recovery facilities) will also increase.

There are 6 active household waste and many other landfill sites in the Plan area, as well as a number of closed sites, some of which have caused pollution problems in the past or may well do in the future. We will continue to work with local authorities, advising them on strategic Local Waste Plans, and with site operators to minimise the risks that landfill sites pose to the environment.

4.0 A BETTER ENVIRONMENT THROUGH PARTNERSHIP

The following policy issues are particularly relevant to the Witham Plan area. We will encourage their inclusion in Local Authority development plans where appropriate:

Policies which:

- resist development that would adversely impact upon air quality;
- encourage the reclamation and re-use of contaminated land where appropriate remediation measures have been put in place;
- locate development in areas where adequate water resources are available or where it can be made available without detriment to the water environment;
- reduce demand for water through incorporation of water efficient appliances, grey water use, water recycling and environmental management systems wherever possible;
- seek to protect floodplains and prevent development which would create an unacceptable increase in the risk of flooding on site or elsewhere;
- prevent developments which would prejudice coastal defences;
- protect, enhance and restore river corridors and coastal margins;
- ensure that adequate foul and surface water drainage infrastructure is available to serve new developments;
- ensure that effective pollution prevention measures are incorporated within development schemes;
- retain, improve and restore public access where appropriate;
- promote water recreation and navigation whilst balancing recreational needs with nature conservation;
- seek to reduce the amount of waste created; and
- ensure that the disposal of waste does not have an adverse effect on any watercourse or groundwater.

Agricultural land use

Economic and commercial pressures have resulted in agricultural practices that may affect the environment, both locally and on a wider scale:

- (i) fertilisers, pesticides and farm-derived waste can impact on both surface and groundwater quality. Pesticide contamination requires expensive remediation and fertilisers contribute to nutrient enrichment, which affects the ecological balance of watercourses.
- (ii) soil quality can be affected by pesticides, which may kill soil organisms, and farm machinery, which can compact and damage soil structure. Changing agricultural practices such as the removal of hedgerows have accelerated soil erosion and this can affect water quality by increasing sediment loading, depositing silt on gravel beds and blocking drainage pipes and culverts. Surface run-off can also carry pollutants into rivers.
- (iii) river maintenance works and lowering of water levels to ensure effective land drainage have a marked effect upon flora and fauna.
- (iv) water abstraction for irrigation affects both water levels and quality.
- (v) ploughing land close to watercourses can increase sediment to run-off following periods of heavy rain.

Genetically Modified Organisms

We have three principal interests in this subject:

- the safe regulation of their industrial use within contained systems;
- safeguarding the environment, and aquatic areas in particular, with respect to the growing of GM crops for food; and
- the potential use of GM plants to decontaminate land as environmental tracers.

We endorse the precautionary approach of English Nature and the properly conducted programme of research and testing into the use of GMOs.

In recognising the need for a sound regulatory system covering land, air and water we will continue to make our scientific expertise available to the government and other interested bodies.

4.0 A BETTER ENVIRONMENT THROUGH PARTNERSHIP

In working to minimise potential risks involved, the Agency works with the agricultural community and other organisations such as MAFF, The Farming and Wildlife Advisory Group and the Countryside Agency to:

- encourage the adoption of relevant best practice guidance such as the Code of Good Agricultural Practices for the Protection of Water, Soil and Air, and other statutory codes of practice such as the Green Code;
- promote Stewardship schemes such as the creation of wet grassland to improve habitat diversity;
- promote access to the countryside;
- encourage the construction of winter storage reservoirs - as an alternative source of water for spray irrigation; and

- implement the new Groundwater Regulations to help prevent pollution of groundwater by controlling discharges or disposals of certain dangerous substances.

We will also:

- adopt more environmentally sensitive practices in our own flood defence and land drainage works; and
- be proactive in educational and awareness campaigns disseminating relevant literature to farmers, giving advice on how they can operate in a more environmentally friendly way.

Industrial Activity

Potentially polluting industrial emissions include:

- (i) discharges made after treatment directly to surface and tidal waters;
- (ii) effluent discharge to foul sewers;
- (iii) discharges to the atmosphere;
- (iv) discharges such as wastes to landfill sites and sewage sludge to land; and
- (v) accidental spillages/discharges causing contamination of land and ultimately surface- and groundwaters.

Water abstraction for industry from watercourses may also impact on downstream water quality, and may affect both groundwater levels and quality.

Responsibility for monitoring and authorising these discharges lies with the Agency (which issues permissions and consents where appropriate), the sewerage undertaker and, in some cases, local authorities. We work with industry and commerce to pre-empt and minimise environmental risks, generally to our mutual benefit but using our enforcement powers where necessary.

Waste reduction practices provide industry and commerce with an opportunity to improve their business performance. Many individual companies have successfully introduced waste minimisation practices, and remove hazardous material (e.g. mercury in domestic batteries) from the waste stream. We welcome the Waste Minimisation Act

(1998), passed with the overall aim of reducing the amount of waste produced annually. This confers extensive powers on Local Authorities to assist in the reduction of commercial, industrial and household wastes.

We are under a duty to prevent or minimise emissions of all prescribed substances from industrial processes under the IPC system, and to render emissions from IPC processes harmless. Power stations are subject to Agency regulation as they are sources of sulphur dioxide (coal-fired stations only) and nitrogen oxides, as well as other pollutants, which potentially affect local air quality. The recently introduced EC Directive concerning Integrated Pollution Prevention and Control (IPPC) essentially consists of preventing, reducing and eliminating pollution, by prioritising pollution prevention at source and ensuring the prudent management of natural resources in compliance with the "polluter pays" principle. IPPC is similar to IPC, but it regulates more industrial sectors and takes more environmental concerns into account. The Agency welcomes IPPC as a more holistic approach to environmental management and regulation, and will continue to work in partnership with industry to achieve it.

4.0 A BETTER ENVIRONMENT THROUGH PARTNERSHIP

The Agency will work in partnership with industry to

- promote and implement waste reduction and minimisation processes;
- encourage waste recovery techniques such as recycling, composting and energy production;
- improve awareness of waste recycling/minimisation opportunities by publicity and education; and
- seek improvements in the quality of industrial emissions and reduce the risk of accidental discharges to the environment.

Local Agenda 21

Local Agenda 21 is the global action plan for the 21st century produced at the Rio Earth Summit in 1992. It brings together economic, environmental and social concerns into a 'blueprint' for a more sustainable way of life, recognising that environmental problems at all levels have their basis in local activities. It emphasises the need to 'Think Globally, Act Locally'. Local authorities were seen as the focus of promoting and encouraging local community action, and were charged with producing a Local Agenda 21.

In the UK, many Local Agenda 21 groups, including those in Lincolnshire, have been involved in the development of local state of the environment reports and sustainability indicators to help identify issues of importance to their area. These issues can then be developed into action plans and projects.

The Agency is obliged under statutory guidance on sustainable development, to assist the Local Agenda 21 process by providing appropriate consultation with local communities involved in LA21 initiatives. We also seek to develop a close and responsive relationship with local communities, including LA21 groups, on matters related to our own functions.

In the Witham area, we are involved in Forums set up by County, District and Unitary Authorities in response to the LA21 initiative, such as the Lincolnshire Environment Forum.

Education and Awareness

One of the ways in which we can bring about environmental improvement and protection is by enhancing public awareness through education. The Agency believes the environment should have an involvement in education at all levels and in all aspects of life, not just through schools and colleges.

Environmental education is central to furthering our commitment to sustainable development. It provides industry, commercial interests and the public with an awareness of and hopefully an impetus to address environmental issues, which is vital to achieving a sustainable society. We also hope to see environmental topics dovetail into the national curriculum and are committed to providing information to 'A' level and university students.

We have a duty to promote the recreational use of inland waters and associated land. Local waterways offer considerable opportunities to access areas of natural beauty, historic interest and conservation value. Information leaflets and posters are often produced in partnership with local authorities, public interest groups and landowners.

As part of our Millennium Festival Project, we are leading a partnership with Lincolnshire County Council, Lincoln City Council, Sustrans and the Groundwork Trust to create a cycle map for Lincoln. This map will provide a way of encouraging sustainable transport in the Lincoln area, increasing the use of the number of cycle routes already in place and allowing more people to enjoy and appreciate the local environment.

3.0 ACTIVITY PLANS

Our education strategy 'Green Shoots', which considers education into the next century, outlines the following actions:

- to help educate young people through teaching aids and other initiatives;
- to improve understanding of environmental issues through links with education, work placements and an awards scheme;
- to work with industry and produce marketing campaigns to promote prevention of pollution rather than its remediation;
- to foster public awareness of environmental issues to encourage responsibility for the environment and its challenges; and
- to build on established and create new international relationships to further sustainable development.

Biodiversity Action Plans

In June 1992, at the Earth Summit in Rio, the Convention on Biological Diversity was signed by the United Kingdom and over 150 other countries. In response to this, "Biodiversity: The UK Action Plan" was launched in January 1994 providing guidance on the production of Local Biodiversity Action Plans. These aim to focus resources to conserve and enhance biodiversity by means of local partnerships, taking national and local priorities into account.

A Local Biodiversity Action Plan (BAP) "framework" has been prepared by the Wildlife Trust for Lincolnshire and the Lincolnshire BAP was published in May 2000. In keeping with Local Agenda 21, the formulation of Local Biodiversity Action Plans should not be undertaken by a single organisation. Delivering the biodiversity targets will require inputs from Central and Local Government, conservation organisations, land managers and members of the public as well as ourselves.

The conservation of biodiversity will be a key indicator of the successful implementation of sustainable development in the area.

We will:

- support and encourage the development and implementation of Local Biodiversity Plans and assist in the identification of targets and priorities.

Archaeology

Archaeological remains are a finite and fragile resource. Our towns and countrysides contain numerous sites of national importance which have been designated as scheduled ancient monuments, and more remains are discovered continuously. Rivers, floodplains and estuaries are particularly rich in archaeological remains, as the waterlogged conditions can preserve organic materials such as

wooden artifacts and timber. These waterlogged deposits may also contain traces of past environments, such as pollen grains and preserved plant fragments, the study of which can lead to a better understanding of environmental change in response to fluctuating sea-levels and climatic variations since the last Ice Age.

Dug-out boats are among the most spectacular of archaeological finds, and often date back to the Bronze Age. They are usually formed from an oak tree trunk, split down the middle and hollowed out both through burning and with tools. Nineteen of these boats have been found in the peat that formed in the valleys of the Witham and its tributaries, and in the middle reaches of the Witham in particular – the Branston and Stainfield parishes have produced four boats each. This stretch of the River Witham would once have been broad and shallow, meandering along the valley floor and, in some areas, extending to a series of lagoons in which any empty boats could be hauled up and left.

Waterlogged deposits are, however, easily desiccated or damaged. This may occur through the over-abstraction of water (leading to a drop in groundwater levels), land drainage, industrial and agricultural pollution or major construction works including flood defence projects.

We will:

- consider the impact of all our duties and activities on archaeological sites through liaison with those who protect them (Local Planning Authorities, County Archaeologists and English Heritage); and
- carry out work, where appropriate, to mitigate damage and enhance archaeological sites, for example through wetland management regimes.

5.0 FUTURE REVIEW AND MONITORING

The Environment Agency will be jointly responsible, with other organisations and individuals, for implementing this LEAP. Progress will be monitored and reported annually. The Annual Reviews will also examine and assess new issues as they arise.

If you require any further information or wish to make any comments, please contact:

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APPENDIX 1 DUTIES, POWERS AND INTERESTS OF THE ENVIRONMENT AGENCY

The Environment Agency has a wide range of interests in the areas of water management, waste management and pollution prevention and control. Whilst many of these interests are supported by statutory duties and powers, much of our work is advisory with the relevant powers resting with other bodies such as Local Planning Authorities

We are often asked about the following areas, but are not responsible for:

- noise problems (except if it is to do with our work);
- litter (unless it is restricting the flow of a river);
- air pollution arising from vehicles, household areas, small businesses and small industry;
- collecting waste in your local area;
- planning permission;
- environmental health; and
- food hygiene.

These are all dealt with by your local authority who will contact us if necessary.

We are not responsible for the quality or supply of drinking water at the tap or for treating sewage waste, although we regulate discharges from sewers and sewage treatment works.

The following table summarises our duties, powers and interests and their relationship to land-use planning.



APPENDIX 1 DUTIES, POWERS AND INTERESTS OF THE ENVIRONMENT AGENCY

AGENCY DUTY	THE AGENCY HAS POWERS TO:	THE AGENCY HAS AN INTEREST (BUT NO POWERS) IN:	PARTNERSHIP
<p>Water Resources To conserve, redistribute, augment and secure the proper use of water resources.</p>	<ul style="list-style-type: none"> ● Grant or vary water abstraction and impoundment licences on application. ● Revoke or vary existing licences to reinstate flows or levels to surface waters or groundwater which have become depleted as a result of abstraction, and are subject to a liability for compensation. ● Secure the proper use of water resources through its role in water-resources planning, the assessment of reasonable need for abstractions and promotion of more efficient use of water resources. ● Monitor and enforce abstraction and impoundment licence conditions. 	<ul style="list-style-type: none"> ● The more efficient use of water by water companies, developers industry, agriculture and the public and the introduction of water-efficiency measures and suitable design and layout of the infrastructure. 	<p>The Agency is committed to water-demand management and will work closely with water companies and developers, local authorities and relevant organisations to promote the efficient use of water. The Agency acknowledges that new resources may be needed in the future and supports a twin-track approach of planning for water resource development alongside the promotion of demand-management measures. The Agency seeks to influence planning decisions for new development by encouraging the inclusion of water-conservation measures in new properties, particularly in areas where water resources are under stress, and by ensuring that planning authorities allow for the lead time for resource development.</p>
<p>Flood Defence To exercise general supervision over all matters relating to flood defence throughout each catchment.</p>	<ul style="list-style-type: none"> ● Control, through Land Drainage consents, development or construction of a structure that would affect the flow of an ordinary watercourse (Water Resources Act, 1991 Section 109, Land Drainage Act, 1991 Section 23). ● Produce flood risk maps for all main rivers under S105 of Water Resources Act 1991. ● Undertake works to main rivers using permissive powers. ● Issue flood warning relating to main river to the public, local authorities and the police. ● Consent mineral workings within 16 metres of main rivers. 	<ul style="list-style-type: none"> ● Granting of planning permission throughout a catchment but especially floodplains where development can significantly increase flood risk. This permission is granted by Local Planning Authorities. ● Installation of surface water source control measures e.g. flood attenuation structures. ● Supervising the maintenance of ordinary watercourses which is a Local Authority remit, but may impact on main rivers. ● Installation of buffer zones which reduce flood risk and have significant environmental benefits. ● Urban and rural land use and measures that can reduce flood risk or the need for watercourse maintenance. 	<p>As a statutory consultee on planning applications within floodplains, the Agency offers advice based on knowledge of flood risk. It also advises on the environmental impacts or proposed floodplain development. The Agency will encourage best practice, including source-control measures and common standards, among Local Authorities and riparian owners to protect and enhance the environment. The Agency works with the civil authorities to prepare flood-warning dissemination plans and supports their endeavours to protect communities at risk.</p>

APPENDIX 1 DUTIES, POWERS AND INTERESTS OF THE ENVIRONMENT AGENCY

AGENCY DUTY	THE AGENCY HAS POWERS TO:	THE AGENCY HAS AN INTEREST (BUT NO POWERS) IN:	PARTNERSHIP
<p>Water Quality To monitor, protect, manage and, where possible, enhance the quality of all controlled waters including rivers, groundwaters, lakes, canals, estuaries and coastal waters through the prevention and control of pollution.</p>	<ul style="list-style-type: none"> ● Issue discharge consents to control pollution loads in controlled waters. ● Regulate discharges to controlled waters in respect of water quality through the issue and enforcement of discharge consents. ● Prosecute polluters and recover the costs of clean-up operations. ● Prevent the pollution of groundwater by issuing groundwater authorisations to control the disposal of List 1 and 2 substances. ● Serve groundwater regulation notices which protect groundwater by prohibiting and/or controlling activities which are causing or have the potential to cause pollution of groundwater. 	<ul style="list-style-type: none"> ● The control of runoff from roads and highways. This is a Highways Agency duty. ● Anti-pollution works notices to require "preventative" work. ● The greater use of source-control measures to reduce pollution by surface-water runoff. ● Prevention and education campaigns to reduce pollution incidents. 	<p>The Agency will liaise with Local Authorities, developers, the Highways Agency, industry and agriculture to promote pollution prevention and the adoption of source-control measures. As a statutory consultee on planning applications, the Agency will advise Local Planning Authorities on the water-quality impact of proposed developments</p>
<p>Air Quality The Agency has a duty to implement Part 1 of the Environment Protection Act 1990.</p>	<ul style="list-style-type: none"> ● Regulate the largest technically-complex and potentially most polluting prescribed industrial processes such as refineries, chemical works and power stations including enforcement of, and guidance on, BATNEEC and BPEO. ● Have regard to the government's National Air Quality Strategy when setting standards for the releases to air from industrial processes. 	<ul style="list-style-type: none"> ● The vast number of smaller industrial processes which are controlled by Local Authorities. ● Control over vehicular emissions and transport planning. 	<p>The Agency provides data on IPC processes and advice on planning applications to Local Authorities. The Agency is willing to offer its technical experience to Local Authorities on the control of air pollution. The Agency wishes to liaise with Local Authorities in the production of their Air Quality Management Plans. The Agency will advise and contribute to the government's National Air Quality Strategy.</p>

APPENDIX 1 DUTIES, POWERS AND INTERESTS OF THE ENVIRONMENT AGENCY

AGENCY DUTY	THE AGENCY HAS POWERS TO:	THE AGENCY HAS AN INTEREST (BUT NO POWERS) IN:	PARTNERSHIP
<p>Radioactive Substances Under the Radioactive Substances Act 1993, to regulate the use of radioactive materials and the disposal of radioactive waste.</p>	<ul style="list-style-type: none"> ● Issue certificates to users of radioactive materials and disposers of radioactive waste, with an overall objective of protecting members of the public. 	<ul style="list-style-type: none"> ● The health effects of radiation. 	<p>The Agency will work with users of the radioactive materials to ensure that radioactive wastes are not unnecessarily created, and that they are safely and appropriately disposed of. The Agency will work with MAFF to ensure that the disposal of radioactive waste creates no unacceptable effects on the food chain. The Agency will work with the Nuclear Installations Inspectorate to ensure adequate protection of workers and the public at nuclear sites. The Agency will work with the HSE on worker-protection issues at non-nuclear sites.</p>
<p>Waste Management Under the Radioactive Substances Act 1993, to regulate the use of radioactive materials and the disposal of radioactive waste.</p>	<ul style="list-style-type: none"> ● Vary waste management licence conditions. ● Suspended and revoke licences. ● Investigate and prosecute illegal waste management operations 	<ul style="list-style-type: none"> ● The siting and granting of planning permission for waste management facilities. This is conducted by the waste industry and Local Planning Authorities. The Agency, as a statutory consultee on planning applications, can advise on such matters. 	<p>The Agency will work with waste producers, the waste-management industry and local authorities to reduce the amount of waste produced, increase reuse and recycling and improve standards of disposal.</p>
<p>Contaminated Land To develop an integrated approach to the prevention and control of land contamination ensuring that remediation is proportionate to risks and cost-effective in terms of the economy and environment.</p>	<ul style="list-style-type: none"> ● Regulate the remediation of contaminated land designated as special sites. ● Prevent future land contamination by means of its IPC, Water Quality and other statutory powers. ● Report on the state of contaminated land. 	<ul style="list-style-type: none"> ● Securing with others, including Local Authorities, landowners and developers, the safe remediation of contaminated land. 	<p>The Agency supports land remediation and will promote this with developers and Local Authorities and other stakeholders.</p>

APPENDIX 1 DUTIES, POWERS AND INTERESTS OF THE ENVIRONMENT AGENCY

AGENCY DUTY	THE AGENCY HAS POWERS TO:	THE AGENCY HAS AN INTEREST (BUT NO POWERS) IN:	PARTNERSHIP
<p>Conservation To further conservation, wherever possible, when carrying out water-management functions; have regard to conservation when carrying out pollution-control functions; and promote the conservation of flora and fauna which are dependent on an aquatic environment.</p> <p>Landscape To further landscape conservation and enhancement when carrying out water-management functions; have regard to the landscape when carrying out pollution-control functions; and promote the conservation and enhancement of the natural beauty of rivers and associated land.</p> <p>Archaeology To consider the impact of all of its regulatory, operational and advising activities upon archaeology and heritage, and implement mitigation and enhancement measures where appropriate.</p>	<ul style="list-style-type: none"> ● The Agency has no direct conservation powers, but uses its powers with regard to water management and pollution control to exploit opportunities for furthering and promoting conservation. ● The Agency must further the conservation and enhancement of natural beauty when exercising its water-management powers and have regard to the landscape in exercising its pollution-control powers. ● The Agency must promote its archaeological objectives through the exercise of its water-management and pollution-control powers and duties. 	<ul style="list-style-type: none"> ● The conservation impacts of new development. These are controlled by Local Planning Authorities. ● Protection of specific sites or species, which is a function of English Nature. The Agency does, however, provide advice to Local Authorities and developers to protect the integrity of such sites or species. ● Implementation of the UK Biodiversity Action Plan. It is the contact point for certain species and habitats. ● The landscape impact of new development, particularly within river corridors. This is controlled by Local Planning Authorities. ● Direct protection or management of sites or archaeological or heritage interest. This is carried out by LPAs, County Archaeologists and English Heritage. 	<p>The Agency supports action to sustain or improve natural and man-made assets so that they are made available for the benefit of present and future generations. Many development schemes have significant implications for conservation. The Agency will work with developers, Local Authorities, conservation bodies and landowners to conserve and enhance biodiversity.</p> <p>The Agency produces River Landscape Assessments and Design Guidelines which it uses when working with Local Authorities and developers to conserve and enhance diverse river landscapes.</p> <p>The Agency will liaise with those organisations which have direct control over archaeological and heritage issues to assist in the conservation and enhancement of these interests.</p>

APPENDIX 1 DUTIES, POWERS AND INTERESTS OF THE ENVIRONMENT AGENCY

AGENCY DUTY	THE AGENCY HAS POWERS TO:	THE AGENCY HAS AN INTEREST (BUT NO POWERS) IN:	PARTNERSHIP
<p>Fisheries To maintain, improve and develop salmon, trout, freshwater and eel fisheries.</p> <p>Recreation To promote rivers and water space for recreational use.</p> <p>Navigation To maintain (with others) the following navigations in the Northern Area of the Anglian Region:</p> <p>Ancholme Witham Welland Nene</p>	<ul style="list-style-type: none"> ● Regulate fisheries by a system of licensing. ● Make and enforce fisheries by-laws to prevent illegal fishing. ● Promote the free passage of fish and consent fish passes. ● Monitor fisheries and enforce measures to prevent fish-entrainment in abstractions. ● Promote its fisheries duty by means of land-drainage consents, water abstraction applications and discharge applications. ● The Agency contributes towards its recreation duty through the exercise of its statutory powers and duties in water management. ● Regulate navigation by a system of licensing. ● Enforce navigation legislation. 	<ul style="list-style-type: none"> ● The determination of planning applications which could affect fisheries. ● Promotion of water sports. This is carried out by the Sports Council and other sports bodies. ● The management and operation of British Waterways' navigations and other navigations within the Region. 	<p>Many development schemes have significant implications for fisheries. The Agency will work with anglers, riparian owners, developers and Local Authorities to protect fisheries.</p> <p>The Agency will work with British Waterways, the Ports and other navigation authorities and navigation users to improve the navigations generally as valuable environmental, recreational, commercial and heritage resources.</p>

APPENDIX 2 THE ROUTINE WORK OF THE ENVIRONMENT AGENCY

On a day-to-day basis, the Agency carries out a huge environmental monitoring and regulatory operation, mainly to achieve statutory requirements and to balance the needs of people and the environment. We aim to:

- save, redistribute and improve river, lake, reservoir and underwater supplies;
- prevent and control pollution of air and water;
- reduce the risk of harm from contaminated land and bring it back into use;
- make sure waste is dealt with safely and legally;
- make sure radioactive materials are kept, used and disposed of safely; and
- make sure flood risks are not created or exacerbated.

Regulating the environment takes place through licensing. We manage licences for abstraction of water from rivers and boreholes, releases to air and water, the carrying and disposal of waste and to carry out work in, over, under or near a watercourse. Within the Plan area we manage over 723 water abstraction licences, 196 consents to discharge to water, 84 waste management licences, over 14 authorisations under Integrated Pollution Control for processes which make releases to air and 49 permits for radioactive materials and waste.

We monitor the environment to ensure that pollution is controlled and resources are adequately protected. We regularly monitor the quantity and quality of rivers, estuaries and the sea and check emissions from the processes we regulate. Results are reported on a public register which can be inspected at the Agency's main offices. We run a 24-hour service for receiving reports of and responding to flooding and pollution incidents and emergencies in the air, water or on land. We also work with others to reduce the risk of harm from contamination and to bring land back into good use.

We work to minimise waste and prevent pollution through advice and education, including national campaigns, and through working with other environmental regulators. When necessary, we are prepared to enforce environmental legislation. Those who show little regard for the law and who cause blatant and persistent damage to the environment can expect to be prosecuted.

We also have the role of reducing risk to people and the environment from flooding by providing effective defences. Protecting life is our highest priority and we provide a flood forecasting and warning service and discourage development in flood-risk areas. We also manage over 630 km of fluvial flood defences and aim to protect and improve the natural

environment by promoting flood defences that work with nature.

We are responsible for maintaining, improving and developing fisheries. We issue licences for rod angling and net fishing, and carry out improvements to fisheries by improving the habitat and fish stocks and providing advice to fishery owners. The Agency seeks to ensure that wildlife, landscape and archaeological heritage are protected in any work we carry out and also in work carried out by others.

Our principal aim for recreation is to protect, improve and promote the water environment for recreational use. We do this by protecting existing use and creating opportunities in the course of our work and by maximising the use of Agency owned sites for recreation.

Our principal tasks for navigation include maintaining river navigations, and maintaining and operating locks, weirs and sluices (and providing access at these sites). We also register and licence boats using our navigations, provide services such as moorings and pump-out facilities, and enforce local legislation and by-laws.

Although we operate an extensive regulatory framework, our actual control over development is limited. We therefore depend on effective liaison with planning authorities. We liaise with planning authorities under the Town and Country Planning legislation and Government planning guidance by providing coordinated responses on development plans and planning applications in order to:

- advise on where proposed development may pose a risk to the public or to property from pollution and/or flooding;
- protect the environment from any possible adverse effects of development;
- wherever possible, enhance the environment in conjunction with development proposals;
- identify demands on our duties and responsibilities, including flood protection, water resource management, conservation and recreation; and
- avoid unnecessary conflict between the use of planning conditions and any possible consents or licences required by the Agency.

Close co-operation between the use of planning authorities and ourselves is essential for effective environmental protection and progress towards more sustainable forms of development.

APPENDIX 3 LINCOLNSHIRE AREA ENVIRONMENT GROUP (AEG) MEMBERS

Linda Clayton	Chairman
Darrell Barkworth	North Lincolnshire Council
Heather Bingley	Lincolnshire Trust for Nature Conservation
David Carnell	Inland Waterways Association
Jim Dodsworth	Lincolnshire County Council
James Epton	Lincolnshire Flood Defence Committee Chairman
Lewis James	RSPB
Fraser MacIntyre	Mid UK Recycling Ltd.
Roger Harvey	British Waterways
Marianne Overton	Institute of Biology
Tony Richards	Witham Joint Anglers Federation
John Rowley	Millenium Inorganic Chemicals
Keith Saveal	Novartis Grimsby
Bud Shields	East Lindsey District Council
Ed Smith	Anglian Water Services Ltd
Christine Talbot	North Kesteven District Council
Rebecca Tibbetts	English Nature
Jack Turner	Lindsey Oil Refinery
Roger Wardle	Farming and Wildlife Advisory Group
Tom Wilson	Lincolnshire Anglers Consultative Committee

APPENDIX 4 ORGANISATIONS AND INDIVIDUALS WHO COMMENTED ON THE DRAFT LEAP

Anglian Water
British Canoe Union
British Waterways
The Coal Authority
The Countryside Agency
Colsterworth with Gunby and Stainby Parish Council
Great Gonerby Parish Council
East Anglian Waterways Association
Faldingworth Parish Council
Fiskerton Parish Council
Forestry Commission
Heydour Parish Council
Heckington Parish Council
Hawk and Owl Trust
Horncastle Town Council
Inland Waterways Association
Long Bennington Parish Council
Ministry of Agriculture, Fisheries and Food
National Farmers' Union
North Carlton Parish Council
Rippingale Parish Council
Scothern Parish Council
Sleaford Navigation Trust
Sudbrooke Parish Council
West Lindsey District Council
Washingborough Parish Council
Waddington Parish Council

EC DIRECTIVES

In protecting the environment, and water quality in particular, we aim to apply the standards set by a number of EC Directives. Some of these are explained below.

EC Bathing Water Directive

The EC Directive on the quality of bathing water seeks to protect public health and the amenity value of popular bathing waters by reducing pollution. The Directive contains standards for 19 microbiological, physical and chemical parameters used to assess bathing water quality. Compliance with the Directive is mainly assessed through testing waters against standards for faecal indicator bacteria.

We are responsible for monitoring the quality of identified, popular bathing waters and providing the results to the DETR. They then decide whether the standards in the Directive have been met. Where identified waters fail to meet the Directive, we are responsible for identifying the sources of pollution that are causing the failures, and making sure that improvements are made. Our priority is to ensure compliance with the mandatory standards of the EC Directive, but we also seek compliance with guideline standards if this is achievable, taking the costs and benefits into account.

EC Dangerous Substances Directive

This EC directive relates to pollution caused by certain substances discharged to the aquatic environment. It aims to protect the water environment by controlling discharges that contain harmful substances to rivers, estuaries and coastal waters.

The Directive describes two lists of compounds. List 1 contains substances regarded as particularly dangerous as they are toxic, persist in the environment and bioaccumulate. Discharges containing List 1 substances, such as sheep-dip, pesticides, solvents, hydrocarbons, mercury, cadmium and cyanide, are controlled through Environmental Quality Standards (EQSs) contained in Daughter Directives. List 2 contains substances which are considered less dangerous, but can nonetheless have a harmful effect on the water environment, such as heavy metals, ammonia and phosphorus. These are controlled by EQSs set by individual member states.

We are responsible for authorising, limiting and monitoring dangerous substances in discharges. We are also responsible for monitoring the quality of waters which receive discharges containing dangerous substances, and reporting the results to the DETR, who decide whether the standards in the Directive have been met. Where the standards are not met, we are responsible for identifying the sources of pollution and for making sure that improvements are made.

EC Freshwater Fish Directive

This is the EC Directive on the quality of waters needing protection or improvement in order to support fish life. It aims to ensure that the quality of designated stretches of water is suitable for supporting certain types of fish. The Directive contains two sets of quality standards. The first set protects cyprinid or coarse fish populations, e.g. roach and chub, whilst the second, stricter set of standards protect salmonids and game fish such as salmon and trout.

We are responsible for monitoring the quality of identified fisheries and reporting the results to the DETR. They then decide whether the standards of the Directive have been met. Where the standards are not met, we are responsible for identifying sources of pollution and making sure that improvements are made.

EC Groundwater Directive (Groundwater Regulations 1998)

These regulations complete the implementation of the 1980 EC Groundwater Directive in England and Wales. The Directive aims to protect groundwater quality by preventing the discharge into groundwaters of List 1 substances, and by limiting the entry of List 2 substances.

Anyone disposing of List 1 or 2 substances to land (unless they are covered by certain exclusions) must have written authorisation from us. These authorisations include conditions to minimise any environmental risks. If the risk to groundwater is considered too great, the application will be refused. No authorisation is required if the activity is already covered by a waste management licence, discharge consent or IPC authorisation.

Other activities that do not include disposal but may nonetheless cause a discharge of a listed substance to the ground must comply with approved codes of practice. These activities could include, for example, the storage and handling of hydrocarbons, solvents and other chemicals, animal carcass burial, use of sheep-dips and other pesticide and sewerage systems. If necessary, we may issue a Groundwater Regulations notice to further control/prohibit the activity.

EC Urban Waste Water Treatment Directive

The EC Directive concerning urban wastewater treatment specifies minimum standards for sewage treatment and sewage collection systems. It specifies that secondary treatment must be provided for all discharges serving population equivalents greater than 2,000 to inland waters and estuaries, and greater than 10,000 to coastal waters. Discharges below these population equivalents receive appropriate treatment as defined by AMP2. This Directive also requires higher standards of treatment for discharges to sensitive areas. We are responsible for making sure that discharges receive the level of treatment specified in the directive.

Habitats Directive

The Agency has responsibilities under the Habitats Directive, which was adopted by the Council of European Communities in May 1992. The Directive aims to sustain European biodiversity and protect rare/threatened habitats and plant and animal species. These regulations apply to Special Areas of Conservation (SACs), which are primarily SSSIs (Sites of Special Scientific Interest, controlled by English Nature) and Special Protection Areas (SPAs), designated under the Birds Directive 1979.

Council Directive 96/61/EC Concerning Integrated Pollution Prevention and Control (IPPC)

The Directive essentially consists of preventing, reducing and eliminating pollution, by prioritising pollution prevention at source and ensuring the prudent management of natural resources in compliance with the "polluter pays" principle. The Agency welcomes IPPC as a more holistic approach to environmental management and regulation, and will continue to work in partnership with industry to achieve it.

The Directive refers to the integrated control and prevention of pollution from installations where the following activities (subject to certain capacity thresholds) are carried out:

- waste management, e.g. landfill, installations disposing of or recovering hazardous waste, sewage sludge incinerators; and
 - other activities, e.g. timber pulp production, slaughterhouses, food/milk processing, intensive pig/poultry units, organic solvent users, carbon production.
- It has been implemented into UK law through the provisions of the Pollution Prevention and Control Act 1999, and covers emissions to all media (air, land and water), as well as heat, noise, vibration, energy efficiency, environmental accidents and site remediation. The introduction of supporting regulations will set out a Europe-wide policy to improve the standard of environmental protection. IPPC is similar to the IPC regime operated by the Agency since 1991, but it regulates more industrial sectors and takes more environmental concerns into account, such as energy conservation and returning sites to their original condition when activities cease.
- energy industries, e.g. power stations, oil and gas refineries;
 - production and processing of metals (ferrous and non-ferrous);
 - mineral industries, e.g. cement and glass works;
 - chemical industries. e.g. organic, inorganic and pharmaceuticals;

APPENDIX 6 GLOSSARY

Abstraction

The removal of water from any source, either permanently or temporarily, usually by pumping.

Abstraction Licence

A statutory document issued by the Environment Agency to permit removal of water from a source of supply. It can limit the quantity of water taken daily.

Agenda 21

A comprehensive programme of worldwide action to achieve a more sustainable pattern of development for the 21st century.

Agrochemicals

Chemical substances used in agricultural production including fertilisers, herbicides, fungicides and insecticides.

Algae

Microscopic (sometimes larger) plants, which may be floating or attached. Algae occur in still and flowing water.

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.

Aquifer

A permeable geological stratum or formation that is capable of both storing and transmitting water in significant amounts.

Asset Management Plans (AMP)

Means by which the water undertakers plan the work required and capital expenditure necessary for improvements and maintenance of the water supply, sewage treatment works and sewerage systems. AMPs cover a five-year period and are drawn up through consultation with the Environment Agency. They then have to be agreed by DETR and OFWAT. The second plan, AMP2, covers the years 1995-2000. AMP3 begins in 2000 and will run to 2005.

Base Flow

That part of the flow in a watercourse made up of groundwater and discharges. It sustains the watercourse in dry weather.

Bathing Water Directive

The EC directive concerning the quality of bathing water which seeks to protect public health and the amenity value of popular bathing waters by reducing pollution. The Directive contains standards for nineteen microbiological, physical and chemical parameters to assess bathing water quality. Compliance is assessed mainly by testing against standards for faecal indicator bacteria.

Berm

A flat part on the side of an embankment used to provide stability for the embankment or for environmental purposes.

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.

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).

Borehole

Generally a small diameter bored hole which is used to exploit an aquifer.

Brundtland Report

Report of the 1987 World Commission on Environment and Development.

Buffer Zone (or Strip)

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.

Consent (Discharge)

A statutory document issued by the Environment Agency. 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 Agency control.

Controlled Waste

Industrial, household and commercial waste, as defined in UK legislation. Controlled waste specifically excludes mine and quarry waste, wastes from premises used for agriculture, some sewage sludge and radioactive waste.

Countryside Stewardship Scheme

Scheme set up by the Countryside Commission in which landowners are grant-aided to manage their land in an environmentally sensitive manner.

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. List 1 substances are regarded as particularly dangerous as they persist in the environment and bio-accumulate. List 2 substances are considered less dangerous but can still have a harmful effect on the water environment. The EC Dangerous Substances Directive protects the water environment by controlling discharges that contain harmful substances to rivers, estuaries and coastal waters.

Demand Management

Activities to manage the amount of water required from a source of supply, including measures to control waste and/or to discourage use.

Diffuse Pollution

Pollution from widespread activities with no one discrete source, e.g. acid rain, pesticides, urban run-off etc.

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.

Drought Order

Drought Orders are made by the Secretary of State upon application by the Environment Agency or a water undertaker (Water Company), under powers conferred by Act of Parliament, to meet deficiencies in the supply of water due to exceptional shortages of rain.

EC Regulation

European Community legislation having legal force in all member states.

EC 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.

Ecosystem

A functioning, interacting system composed of one or more living organisms and their effective environment, in biological, chemical and physical sense.

Effluent

Liquid waste from industry, agriculture or sewage treatment plants.

Emission

A material which is expelled or released to the environment. Usually applied to gaseous or odorous discharges to the atmosphere.

Environmental Assessment

The process of evaluating the environmental pros and cons of proposals (often for civil engineering works). Formal Environmental Assessment is carried out and advertised under Statutory Instrument 1217.

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.

Eutrophic

A description of water which is rich in nutrients. At worst, such waters are sometimes beset with unsightly growths of algae.

Eutrophication

The enrichment of water by nutrients, especially nitrogen and/or phosphorous, which can cause accelerated growth of algae and high plant life, changes in ecological balance and deterioration in water quality.

Fish Biomass

A measure of the quality of a fishery as found in terms of surveys and weight by area (g/m²).

Fish Pass

A device to permit fish to transverse structures within a river.

Flood Defence Standard

Where a defence is provided the Flood Defence Standard describes the level of protection given by reference to the return frequency of a flood event which would overtop the defence.

Flood Storage Reservoir

An area of land whose prime purpose is to receive and store flood flows, usually to prevent flooding of adjacent or valuable land.

Floodplain

This includes all land adjacent to a watercourse over which water flows or would flow but for flood defences in times of flood.

Fly Tipping

The illegal dumping of rubbish/material in places such as hedgerows, lay-bys and fields.

Gas Migration

The movement of gas from the wastes within a landfill site to adjoining strata, or emission into the atmosphere.

General Quality Assessment (GQA)

A classification scheme providing 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 with:- A & B (Good); C & D (Fair); E Poor and F (Bad). Other grades for estuarine and coastal waters are being developed; and aesthetic components will be measured and graded by a system currently under trial.

Groundwater

May refer to all subsurface water as distinct from surface water. Generally groundwater is considered to be that water which is below the zone of saturation and contained within porous soil or rock stratum (aquifer).

Groundwater Protection Policy

Environment Agency policy which controls activities having the potential to pollute groundwater resources.

Groundwater Regulations 1998

These regulations complete the implementation of the 1980 EC Groundwater Directive in England and Wales. The directive aims to protect the quality of groundwater by preventing the discharge into groundwater of List 1 substances; and limit the discharge of substances in List 2 so as to prevent pollution.

APPENDIX 6 GLOSSARY

HABSCORE

A system for measuring and evaluating stream salmonid features. HABSCORE requires information from three sources relating to site specific habitat features, catchment features and the observed salmonid populations at a site.

Hydrogeology

The study of the occurrence and movement of groundwater and the interaction with geology.

Hydrometric

The measurement of water.

Impermeable

Used to describe materials, natural or synthetic, which have the ability to resist the passage of fluid through them

Inert Waste

Category of waste which includes material which will either not decompose, or will decompose very slowly. Materials in this category would include waste from the construction industry such as hardcore, soil, stone and glass.

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 environmental 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.

Integrated Pollution Control

A system of pollution control that applies to the most potentially polluting or technologically complex industrial and other processes in UK. IPC deals with releases of all media (air, land and water) and uses the principles of BATNEEC and BPEO.

Landfill

The engineered deposit of waste into or onto land in such a way that pollution or harm to the environment is minimized or prevented. Restoration can provide land which may be used for another purpose.

Landfill Gas

A by-product of the digestion by micro-organisms of putrescible matter present in waste deposited in landfill sites. The gas is predominantly methane (64%) together with carbon dioxide (34%) and trace concentrations of other gases.

Leachate

Liquor formed by the act of leaching from landfill sites.

List 1 and 2 Substances

See Dangerous Substances

Main River

Watercourses shown on the statutory Main River maps held by the Environment Agency and MAFF. The Agency has permissive powers to carry out works of maintenance and improvement on these rivers.

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.

Nitrate Sensitive Area (NSA)

An area where nitrate concentrations in sources of public drinking water exceed, or are at risk of exceeding, the limit laid down in the 1980 EC Drinking Water Directive, and where voluntary, compensated agricultural measures have been introduced as a means of reducing those levels.

Nitrate Vulnerable Zone (NVZ)

An area where nitrate concentrations in ground and surface waters exceed, or are at risk of exceeding, the limit of 50mg/l laid down in the 1991 EC Nitrate Directive, and where compulsory, uncompensated agricultural measures came into force in existing NVZs on 19 December 1998 as a means of reducing those levels.

Non-Fossil Fuel Obligation

A requirement on regional electricity companies in England and Wales to purchase from specified producers, at a premium price, for a fixed period, specified amounts of electricity generated by methods other than burning fossil fuels.

Nutrient

Substance providing nourishment for plants and animals e.g. nitrogen, phosphorus.

OFWAT

Office of Water Trading: the financial regulator of water service companies.

Outfall

The point at which a river discharges to a downstream source, e.g. estuary or sea. It may also include an outfall structure to prevent seawaters backing up the system.

Part A Process

Processes prescribed for Integrated Pollution Control (IPC). IPC regulates those processes with the greatest potential for serious pollution to the three environmental media. Part A processes are regulated by the Environment Agency.

Part B Process

Processes regulated under the local authority air pollution control system, with less serious potential to pollute.

Putrescible Waste

Solid waste which will produce leachate when chemically and or biologically degraded.

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).

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, e.g. 1 in 50 years.

Revetment

An anti-erosion surfacing such as concrete, tarmac or grass which protects an embankment or river bank.

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 Quality Objective (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 (WQOs)

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.

Sewerage

System of sewers usually used to transport sewage to a sewage treatment works.

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 clay and silt is particularly difficult to remove naturally as it requires turbulence 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.

Source Protection Zone

A Source Protection Zone (SPZ) is the area over which recharge is captured by an abstraction borehole. SPZs are designated by the Environment Agency and are delineated to protect potable water supplies against the polluting effects of human activity.

Special Protection Area (SPA)

Statutory protected habitats for wild birds under EC Regulations.

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.

Telemetry

A means of directly collecting data from remote sites.

Urban Run-Off

Rainfall from towns and cities that is carried off by streams and rivers.

Urban Waste Water Treatment Directive (UWWTD)

The EC Directive concerning urban wastewater treatment which specifies minimum standards for sewage treatment and sewage collection systems. Specifications include that secondary treatment must be provided for all discharges serving population equivalents greater than 2000 to inland waters and estuaries, and greater than 10,000 to coastal waters. We are responsible for making sure that discharges receive the level of treatment specified in the Directive. Discharges below these population levels receive appropriate treatment as defined in AMP2 guidance. The Directive also requires higher treatment standards for discharges to sensitive areas.

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.

Waste Minimisation

Reducing the quantity and/or hazard of waste produced.

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 the Environment Agency 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.

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.

APPENDIX 6 GLOSSARY

AMP	Asset Management Plan	GQA	General Quality Assessment	RQO	River Quality Objective
ARTS	Anglian Region Telemetry System	IDB	Internal Drainage Board	RSPB	Royal Society for the Protection of Birds
AWS	Anglian Water Services Ltd	IFE	Institute of Freshwater Ecology	SAC	Special Area of Conservation
BAP	Biodiversity Action Plan	IPC	Integrated Pollution Control	SA(E)	Sensitive Area (Eutrophic)
BASIS	British Agrochemical Standards Inspection Scheme	LA	Local Authority	SO_x	Sulphur Oxides
BATNEEC	Best Available Technique Not Entailing Excessive Costs	LGA	Local Government Association	SPA	Special Protection Area
BPEO	Best Practicable Environmental Option	LIFE	Lotic-invertebrate Index for Flow Evaluation	SSSI	Site of Special Scientific Interest
BW	British Waterways	LPA	Local Planning Authority	STW	Sewage Treatment Works
CA	Countryside Agency	LTNC	Lincolnshire Trust for Nature Conservation	SWQO	Statutory Water Quality Objective
CAMS	Catchment Abstraction Management Strategies	MAFF	Ministry of Agriculture Fisheries and Food	TBE	To Be Established
CLA	Country Landowners Association	MoD	Ministry of Defence	UWWTD	Urban Waste Water Treatment Directive
DETR	Department of the Environment Transport & the Regions	NA	Non-Agency	WLMP	Water Level Management Plan
EC	European Community	NFFO	Non-Fossil Fuel Obligation	WQO	Water Quality Objective
EN	English Nature	NFU	National Farmers' Union	WRC	Water Research Council
FRCA	Farming and Rural Conservation Agency	NO_x	Nitrogen Oxides	WT	Wildlife Trust
FSB	Federation of Small Businesses	NSA	Nitrate Sensitive Area		
FWAG	Farming and Wildlife Advisory Group	NT	National Trust		
GIA	Grant In Aid	NVZ	Nitrate Vulnerable Zone		
		OFWAT	Office of Water Trading		
		PWS	Public Water Supply		
		RE	River Ecosystem		

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