

# local environment agency plan

## WITHAM

DRAFT LEAP

SEPTEMBER 1999

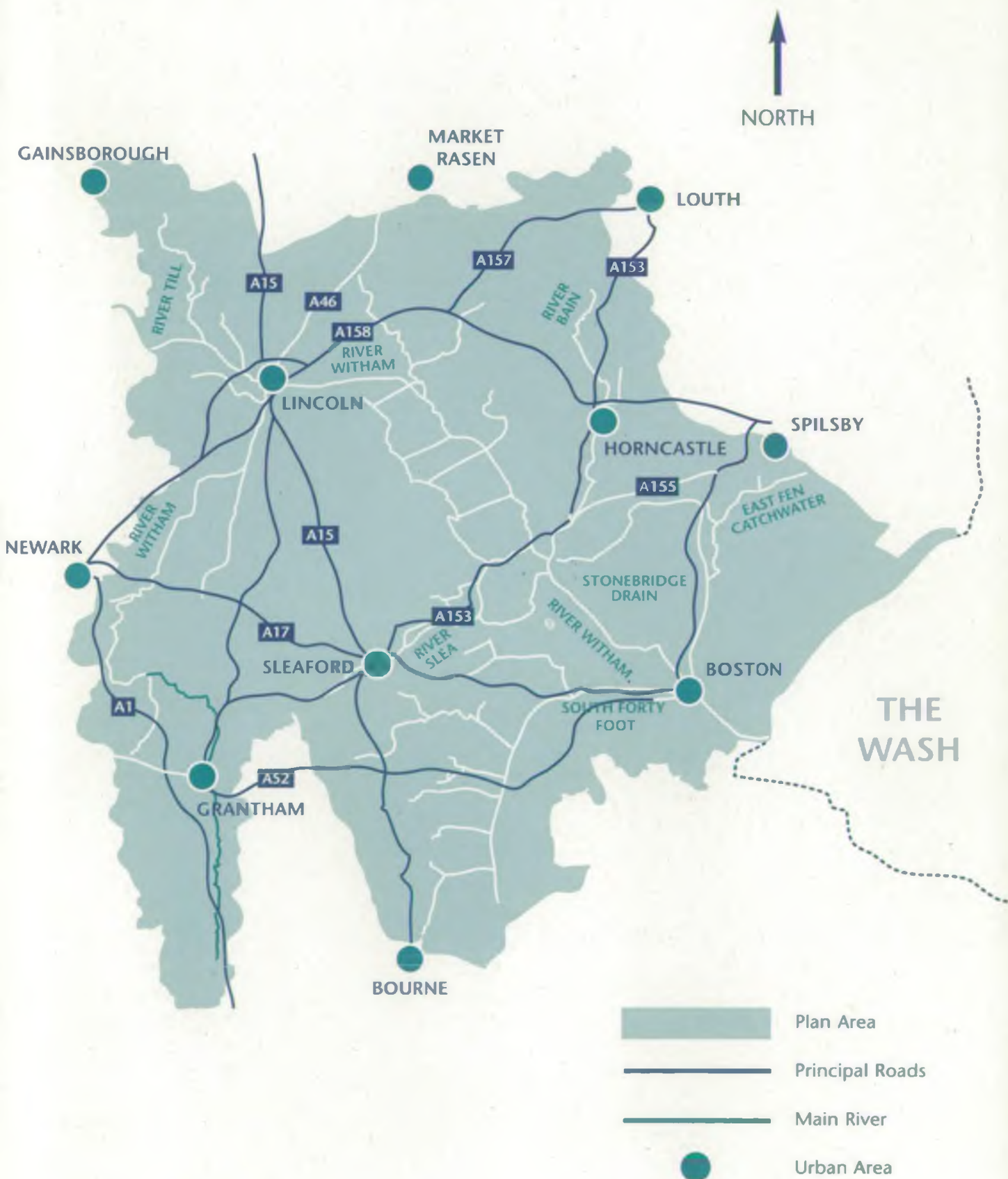


ENVIRONMENT  
AGENCY

# key details

Total Area:	3,224 km²	
Population:(approximate)	347,673	
Environment Agency Offices:	Anglian Region (Northern Area) Waterside House, Lincoln LN2 5HA Tel: (01522) 513100	Lincolnshire Catchment Office Guy Gibson Hall, Manby Park Louth LN11 8UR Tel: (01507) 328102
Administration Details:	County Councils: Lincolnshire, Nottinghamshire, Leicestershire District Councils: West Lindsey, East Lindsey, North Kesteven, South Kesteven, South Holland,Newark Borough Councils: Boston, Melton Unitary Authorities: Rutland	
Water Utilities Company:	Anglian Water Services 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 Defence:	22 km	
Length of Sea Defence:	20 km	
Length of Coarse Fishery:	374 km	
Length of Trout Fishery:	34 km	
Water Quality:		
Biological Quality Grades 1997	Grade	Length of River
	'Very Good'	97.1
	'Good'	297.2
	'Fairly Good'	192.4
	'Fair'	73.9
	'Poor'	42.9
	'Bad'	1.3
Chemical Water Quality 1998	Grade	Length of River
	'Very Good'	11
	'Good'	112
	'Fairly Good'	143
	'Fair'	83
	'Poor'	50
	'Bad'	0
Major Sewage Treatment Works:	Lincoln, North Hykeham, Marston, Anwick, Boston, Sleaford	
Integrated Pollution Control Authorisation Sites:	14	
Sites of Special Scientific Interest:	61	
Sites of Nature Conservation Interest:	4	
Archaeological Sites:	199	
Waste Management Facilities:	Licensed Landfill: 28 Metal Recycling Facilities: 21 Licensed Transfer Station: 30 Incinerator: 2	
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 % No. of Surface Water 402 No. of Groundwater 281 No. of Impounding 40	







# your views

Publishing the Draft LEAP marks the beginning of the Consultation Period for the Witham area. This document highlights the issues we believe need to be addressed in this area.

We hope that this report will be read by everyone who has an interest in the environment in this locality. Your views will help us finalise the LEAP.

In particular, we want to hear your views on the following:

- Have we identified the major issues?
- Have we identified all the potential options for action to resolve these?
- Do you agree with our Vision for the plan area?
- Have you any comments on the appearance and contents of the report?

Please comment in writing to:

The Customer Services Manager  
Witham LEAP  
Environment Agency - Anglian Region Northern Area  
Waterside House  
Waterside North  
Lincoln LN2 5HA

Tel: (01522) 513100 Fax: (01522) 512927

All comments should reach us by 6 December 1999.

Further copies of the publication are also available at the above address.



ENVIRONMENT AGENCY

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## Vision for the Witham Plan Area

Our Vision for the Witham Plan area is to see its valuable environmental assets protected from pressures caused by 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 within what is a developing economy.

To accomplish this Vision we will work with local communities and others towards the sustainable management of the area, balancing the interests of all users. In this way the following objectives will be pursued:-

- The maintenance and enhancement of the areas conservation value, through initiatives such as Biodiversity Action Plans (BAPs).
- The promotion of the recreational value of the Plan area, without compromising the needs of the environment.
- The management of water resources of the limestone aquifer and Rivers Witham, Till, Sleas, Bain and Waring.
- The maintenance and improvement of water quality.
- The maintenance of high standards of flood defences and where necessary, improvement in the level of protection for people and property.
- The promotion and maintenance of a healthy fish population.

- The overall prevention and reduction of emissions to the air, water and land from potentially polluting installations.



*Greetham*

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## CHAPTER 1 – 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
- 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

## Introduction - The Environment Agency

The Environment Agency has a wide range of duties and powers relating to different aspects of environmental management. These duties together with those areas where we have an interest, but no powers in, are described in more detail in Appendix 1. 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 is the integration of human needs and the environment within which we live. Indeed 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 therefore have to reflect this in the way we work and in the decisions we make.

Taking a long-term perspective will require us to anticipate risks and encourage precaution, particularly where impacts on the environment may have long-term effects, or when the effects are not reversible. Where possible and where opportunities arise we will endeavour to develop our role to educate and inform society as a whole, as well as carrying 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 "Earth Summit" held in Rio de Janeiro in 1992 was agreement by governments that, in order to solve global environmental problems, local action is crucial. We must all therefore think globally but act locally.



## Local Environment Agency Plans

For our part we are committed to a programme of Local Environment Agency Plans (LEAPs) in order to produce a local agenda of integrated action for environmental improvement. These will also allow us to deploy our resources to best effect and optimise benefit for the local environment.

LEAPs help us to identify and assess, prioritise and solve local environmental issues related to our functions, taking into account the views of our local customers. The outcome of the process is a local programme of integrated action for environmental improvement in order to optimise benefit for the local environment.

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

The LEAP process involves several stages as outlined below.

### Draft LEAP

The publication of the Witham Draft LEAP marks 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.

At the end of the consultation period we will produce a Statement on Public Consultation which will summarise the views expressed in the consultation process.

An overview of the environment covering the whole of Lincolnshire (Witham, Louth Coastal and Grimsby Ancholme catchments) is to be produced in September 1999. Issues detailed in the

three LEAPs covering this area will be reflected in this document which will illustrate the current stresses and strains on this environment.

### The LEAP

Following the consultation process a final LEAP will be produced February / March 1999. This will be a 5 year plan identifying actions, costs and timescales for both the Agency and its partners to resolve the issues identified. Where appropriate, agreed actions will be incorporated into the Agency's annual business plans.

### Annual Review

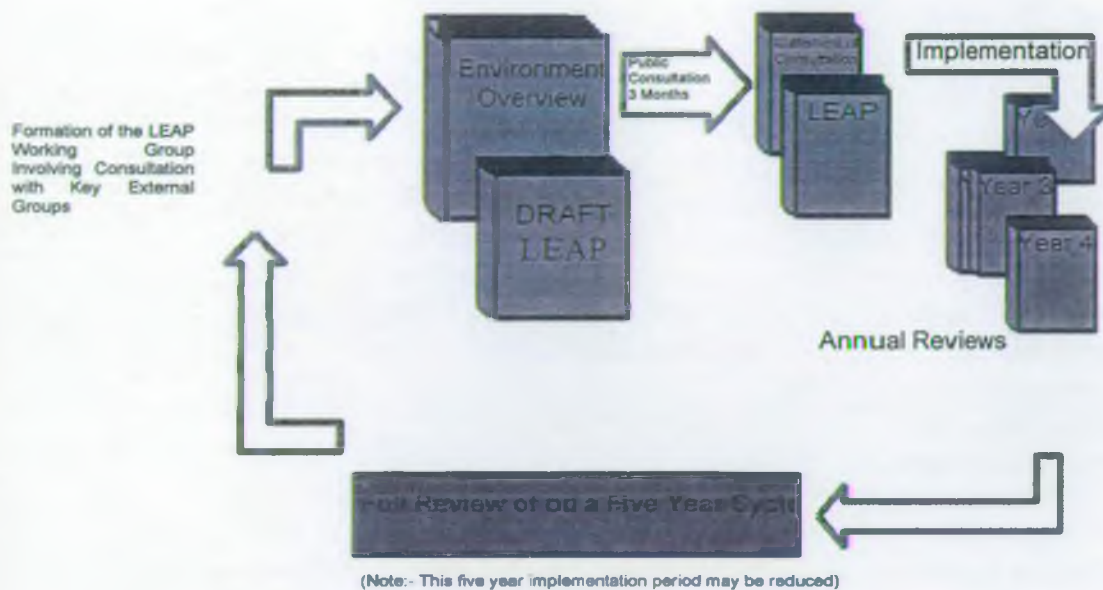
We will monitor implementation of the LEAP and report on progress in a published Annual Review. The Annual Review will also identify any additional actions needed to maintain progress in light of any changes in the LEAP area and also remove or amend actions where they are no longer appropriate. After five years, or sooner if required, we will carry out a major review of the progress we have made. At this stage we will produce a new Draft LEAP to reflect these changes to further improve the local environment.



*Scopwick Beck*



**Diagram: The LEAP Process**



*Wolds Landscape*



## CHAPTER 2 – THE LEAP AREA

### (i) Introduction

The Plan area for this LEAP includes the water catchments 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 to this Plan area, the River Witham whose source is at South Witham.

The course of the Witham and its valley is initially northward from Grantham and along the Lincoln Edge (a ridge of limestone which runs through to the Cotswolds) towards the gap in the escarpment and then south east to the fens and Boston.

From South Witham the River Witham grows and matures as it makes its way to the busy engineering town of Grantham. Wharf Road, Grantham is a reminder that this was the final part of a canal to Nottingham from 1797 to 1936. Now this area is the site of the Sir Isaac Newton Shopping Centre, built in 1983 commemorating the former pupil of Kings School, Grantham. The Witham from here makes its way through fertile ground to Lincoln where it empties into the Brayford Pool before moving through this historic city.

Navigation and drainage has made a significant impact on this Plan area. In particular the Fossdyke Canal, from the west at Torksey, which was built by the Romans probably in the first instance for drainage but with the advantage of navigation. The Fossdyke is Britain's oldest canal still in use. 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 between grassed flood banks. The true length of the Roman Canal is only that length between Torksey and Odder. The

remainder of the route between Odder and Lincoln is really the straightened course of the River Till.

At Lincoln the Fossdyke enters the Brayford Pool (as does the River Witham from Grantham), an inland port excavated by the Romans but initially a lake which formed thousands of years ago. In Viking times this area received goods from Scandinavia and Europe. Later the Normans landed stone for

building the cathedral and castle, and in the medieval era the port made Lincoln a main centre for the wool trade. The waterfront has always been an important feature of Lincoln's history and now it is being revitalised with the construction of the University of Lincolnshire which is by its presence attracting development to the area. Downstream from here is the Glory Hole or High Bridge. The oldest bridge in this country with buildings still upon it. The barrel vaulted span is Norman and caused for hundreds of years navigational problems. Lincoln Corporation, through suggestions by William Jessop, altered in 1795 the High Bridge to give more depth of water for laden boats. A proportion of the cost was paid by the proprietors of the Sleas Navigation and the Horncastle Canal. Lincoln's fame not only links to the medieval era with its magnificent Cathedral (constructed from local limestone and purbeck marble) but also to its more recent past as a city which produced the first military tank. Today Lincoln's economy is boosted by local light engineering and service based industries, it boasts a busy and prosperous shopping centre including 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 the open countryside. From here it moves into a man-made section of the River Witham with engineered flood banks. The floodbanks are low and the Witham is 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 arable acres of rich agricultural land unfold from the south bank and woodland just to the north. The British Sugar factory at Bardney receives sugar beet from local land and beyond. The route of the dismantled Great Northern Railway follows the north bank between Bardney and Boston. From Southrey to Kirkstead Bridge there is quiet farmland, with scattered villages. To the south and west drained fens are vast, remote and fertile.

owing its existence to the accidental discovery of natural mineral water in the early 19<sup>th</sup> Century.

The Witham now flows from Kirkstead Bridge where the Timberland Delph enters the river to Tattershall Bridge where just upstream Billingham Skirth also comes in. The river continues past Dogdyke Pumping Station where just upstream from Dogdyke the River Bain from Horncastle discharges to the Witham before the River Sleas / Kyme Eau comes in downstream at Chapel Hill. The Sleas carries water which rises at springs known as Boiling Wells upstream of Sleaford. During the nineteenth century Sleaford grew as a commercial centre with the River Sleas powering eighteen mills. Throughout its trading years two cargoes dominated on the Sleas : outward; corn and milled grain from the surrounding area, and inward: coal from Yorkshire and Derbyshire.



*The Fossdyke canal - Torksey*

To the north and east the land eventually leads to Woodhall Spa. This small town

The Sleas's most prosperous period was in the 1840's but it was not to last. With the increasing use of rail travel, boat traffic



decreased and the Slea Navigation Company ceased to exist by 1881.

- Navigation only kept open on the lower reaches until the 1930s. The Slea Navigation Society however intends to reverse this situation. With its formation in 1977 it aims to return this waterway to a navigation once again.

From Chapel Hill the River makes its way to Langrick Bridge and to Boston the capital of the Lincolnshire fens. The south bank is linked with houses with the town centre confined to the north bank. A short distance downstream of the Grand Sluice, overlooking everything, is the famous "Stump" of St Botolph's – the largest parish church in England. The tower is 272 feet high, and from it are panoramic views of Lincolnshire and the Wash. Upstream of Grand Sluice, Boston the Witham is a controlled waterway. Downstream it is the uncontrolled tidal link to the Wash Estuary.

At the lower end of the Witham system the South Forty Foot Drain, Maud Foster Drain and Hobhole Drain enter at various points prior to discharge to the Wash. Under normal flow conditions the South Forty Foot Drain discharges through outfall sluices. However, in times of very heavy flows the pumps from Black Sluice Pumping Station are used to discharge water during the hours of high tide when gravity discharge is not possible. The Maud Foster is totally a gravity system where as the Hobhole discharges by gravity during normal flow conditions but again during high flows a pumped discharge is made.

## (ii) State of the Environment

The waters of the River Witham and its tributaries support a wide variety of fish communities. The Witham catchment includes river sections that show a range of typical fish zones. The upstream headwaters contain brown trout, grayling

and associated fish species. The fish assemblage alters as the river is descended from salmonid through to flow loving coarse fish species and then onto 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 that reflects the high quality recreational resource that constitutes the River Witham today. This however, conflicts with anglers views at the present time who believe fish numbers in this river system are dropping. The Agency is looking closer at this matter.

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

In the low lying areas of the Catchment, modifications to the river and drainage systems for land drainage purposes 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 bio-diversity. This situation is accentuated by the maintenance of low winter water levels in many of the watercourses.

There are 61 Sites of Special Scientific Interest (SSSI) in the area. In order to ensure important water dependent SSSI's receive due consideration for their future well-being, interested parties, including English Nature and those drainage



authorities operating in areas where SSSIs exist, have been tasked to produce Water Level Management Plans for identified sites.

Catchment. A number of flood defence schemes are being pursued to achieve these standards.



#### *Friskney Duck Decoy*

The area is protected by flood defences, maintenance of such is of vital importance for the protection of both land and people, particularly against the background 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 protecting Boston provide a level of protection for a 1 in 100 year tide event with sufficient freeboard to allow for the rise in levels into the next century. However, in the early part of 21<sup>st</sup> Century the prospect of raising the defence still higher will have to be considered.

The flood defence standards for lengths of the Lower Witham between Lincoln and Boston including its tributaries are below Agency Standards of Service targets.

A Strategy Study was published by the Environment Agency in 1997 which recommended a level of service reaching a required minimum level throughout the

Elsewhere on the Upper Witham at Grantham and the South Forty Foot Drain Agency target standards are not be currently being met, this Plan looks at options to resolve this situation.

The Witham Catchment has a very high percentage of high quality, best and most versatile agricultural land. The area is dominated by cereals and general cropping however, there are small pockets of land associated with livestock rearing. Land quality is clearly divided with high quality grade 1 land lying along the coast and around Boston.

Further inland the land becomes grade 2 in quality in a band following the line of the coast. These soils are silts and peats around the Wash, capable of growing the widest range of crops and are particularly good for growing horticultural crops. With distance from the Wash the land quality becomes mainly grade 3 interspersed with grade 2 on the free



draining lighter calcareous soils of the Lincolnshire Wolds and edge. The poorer quality land exists where soils are heavier and have a tendency to be poorly drained, such as the boulder clays and soils adjoining the river. These soils are alluvial and are normally associated with wet meadowland and pastures which are environmentally important as they support a variety of plants and wildlife. Such landscapes are threatened by drainage and changes in management regimes and so it is important that water levels in such areas are carefully monitored and maintained.

Air quality in this predominantly rural area is relatively good and has been improving in recent years. Emissions from industrial processes are regulated to minimise their impact upon the environment. At a global level there are obviously concerns including atmospheric ozone levels and acid rain which impact on us all.

The quality of rivers in the Witham Catchment is generally good to fair. The uppermost reaches of this water system are generally unpolluted. However, as the river flows more slowly through the fertile agricultural areas downstream of Grantham, eutrophic effects generally reduce river quality. Major effluent inputs from urban areas such as at Lincoln add to this effect. Groundwater quality is generally good, however as with surface water, the rural nature of the area has a major influence on it. Where aquifer outcrops at the surface, groundwater is highly vulnerable to pollution. Due to increased fertiliser application, since the Second World War nitrate levels have been gradually rising resulting in nitrate concentrations being observed in some surface and groundwaters in the Plan area such that EC Surface Water and Nitrate Directives' standards are exceeded.

The disposal of waste in landfill sites is a potential risk to ground and surface water quality. As the regulating authority for

waste management, we have a remit to ensure due care is taken in the handling and disposal of waste (both to land and water). In this role the Agency advocates the concept of sustainable waste management, which involves promoting waste minimisation and waste recycling opportunities. In addition we have developed a Groundwater Protection Policy which sets out to minimise the risks to groundwater from development and change in land use. This is realised through the planning process.

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 supply, agricultural and industrial purposes. This resource is fully committed and no additional water is available for further abstraction licences. The River Witham is also a valuable source of water for both public water supply and agriculture. Farmers use this resource, through winter abstraction and storage or direct for summer abstraction, to grow high quality crops, particularly potatoes and sugar beet.

Water resources benefits from the Trent Witham Ancholme (TWA) river transfer scheme which is owned and operated by the Agency and forms a key infrastructure link for the use of surface water resources and abstractions across North Lincolnshire. The scheme comprises two river transfers from the River Witham (at Short Ferry) to the River Ancholme and from the River Trent (at Torksey) to the River Witham and a storage reservoir located at Toft Newton in the headwaters of the Ancholme catchment. Within the Witham system the TWA scheme is key to the management of water resources, maintenance of summer levels and meeting agricultural and spray irrigation abstraction needs from the River Witham.

### **CHAPTER 3 - ISSUES AND PROPOSED ACTIONS**

In September 1997 the Environment Agency produced a document entitled 'An Environmental Strategy for the Millennium and Beyond'. This strategy is essentially based upon the need to take an integrated approach to the management of the whole environment. In producing this Plan we have therefore used the principal and immediate concerns set out in the *Strategy* to group the Issues and show how LEAPs utilise integrated action for local environmental improvement.

Our principal and immediate environmental concerns in the Witham area relate to:

•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



The captions shown are used in the Issues section to denote the inter-relationships of potential actions.



## **TITLES OF LEAP ISSUES**

### **Managing Our WATER RESOURCES**

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

### **Enhancing BIODIVERSITY**

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

### **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 down stream free passage of fish is restricted by weirs, locks and other impoundments, which also alter the aquatic environment.

### **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 Nitrate concentrations in some ground and surface waters exceed, or are expected to exceed the EC Nitrate Directive limit.
- 4c Contaminated land sites have the potential to cause further pollution and cause harm to human health.
- 4d Routine chemical monitoring indicates poor water quality at a number of sites/stretches in the plan area.
- 4e 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.
- 4f Inadequate local sewerage systems in some villages result in localised pollution and may have public health implications.
- 4g Water quality of the Witham, Hobhole, Maud Foster, and South Forty Foot Drain are affected by saline intrusion.
- 4h The escape of aviation fuel into the aquifer underlying RAF Waddington continues to pose a risk to the environment.
- 4i Land contaminated as a result of past industrial practices, causes water quality to fail the EC Dangerous Substances Directive.

### **Conserving the LAND**

- 5a The level of protection provided by, and the condition of, existing defences on the

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

### **Managing WASTE**

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

### **Addressing Climate Change**

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

### **Presentation of Issues**

The boxes at the beginning of each Section set out the Agency's strategic actions and policies that address some of these challenges. The individual Issues reflect local weaknesses against these aims. Our intended approach for dealing with these challenges is set out in the following text and tables, which show:

- The **Title** of the Issue.
- Supporting **background text** to explain the Issue.
- Preferred and alternative **Options** for resolutions of the Issue.
- Responsible **organisations** who will implement the proposed activities, either in a lead role or in partnership with others.
- **Comments** on each option

The following points should also be noted:

- Our everyday work commits substantial resources to monitoring and managing the environment. This work is explained briefly at Appendix 2
- Should more Issues become apparent during the Consultation Period, they will be incorporated into the final LEAP as appropriate.
- The Issues and Options are not presented in any order of priority and the Options are not mutually exclusive.
- Issues relating to the Wash Estuary and Wash LEAP and not duplicated in this Plan.
- Options have not been costed out in this Plan because of the resource implications of that task, they will obviously be considered as the final LEAP is developed and reflected therein.



## 1. Managing our Water Resources

Agency Operational and Strategic Actions are to:

- demand a more efficient use of water by the water companies and by industry in general;
- encourage a more efficient use of water by the public and a change in public attitude to water usage;
- promote "best practice" and will 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;
- demand reductions in leakage by the water companies before considering any cases for investment in new reservoirs;
- 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;
- not approve the exploitation of new environmental resources until water saving measures have been introduced;
- 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 that all environmental needs are fully taken into account within the next Asset Management Plans (AMPs) negotiations with the water companies; and,
- research into more efficient methods for the management of water, and into the potential risks for the aquatic environment arising from its mis-management.

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

Most abstraction licences granted today have conditions which prevent abstraction when flows or levels fall below a stated value. This is because licences granted many years ago have been found, in the absence of abundant water resource, to have been issued with insufficient controls to adequately protect the aquatic environment, or none at all as in the case of Licences of Right. Under these circumstances some licences can enable the whole flow of a river to be abstracted.

The Department of the Environment Transport and the Regions (DETR) has undertaken a review of the licensing system for abstraction. Proposed legislative change following this review will probably enable the Agency to review all abstraction licences and impose suitable conditions to protect the Environment. This work will take many years, but where possible it is current practice to use existing legislation to promote changes in the interim. We are starting on work that will in time lead to Abstraction Management Strategies (AMS) which will clearly spell out and consult on abstraction policy for a catchment and possibly subcatchment basis. The AMS are likely to include catchment conditions and time limits to be applied to licences and consider river flow objectives. The concept of minimum acceptable flows has been in legislation governing water abstraction for 35 years but during that time no such flows have been set under statute. A major difficulty has always been seen as 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 generally on an 'ad hoc' and largely inconsistent basis in relation to these requirements.

The Agency is particularly concerned about the potential impacts of reduced flow in the Cringle Brook which is a high value water environment. It has an extremely diverse stream fauna. Native Crayfish (*Austropotamobius pallipes*) for example, breed in the brook, one of only two populations in the Upper Witham. This is one of the species identified for protection as part of the UK Biodiversity Action Plan. We are working with a number of organisations to formulate habitat and species action plans at both regional and local levels, and is the contact point for the Native Crayfish. See issue 2b(iii). The Brook's population is of enormous local and national significance.

**Effects**

Low flow periods such as summers and droughts have been extended or exacerbated. Even if a licence has not been used to its full extent to the detriment of flow, the potential to abstract most of the river is a real threat for the future.



Options	Responsibility	Comments	Theme
<b>General:</b> <i>In advance of DETR legislation and AMSs seek voluntary cooperation of abstractor to accommodate conditions in licences to protect the water environment.</i>	<i>Agency / Abstractors</i>	<i>Adequate protection to the water environment may be achieved in the shorter term.</i>	
<i>Develop the concept of AMS's to set out for consultation clear policies on abstraction.</i>	<i>Agency</i>	<i>Management of all abstraction licences to ensure sustainable abstraction and appropriate protection for the water environment. Clear long term policies for abstractors. This is a long term initiative.</i>	
<i>Cringle Brook : Seek the cooperation of Anglian Water to accommodate changes to their licence, including the provision of a satisfactory flow control to afford more protection to the river environment</i>	<i>Agency / Anglian water Services Ltd</i>	<i>Protection of the river environment. Anglian Water fulfilling their environmental responsibilities. Minimal impact on Anglian Water's operation and costs.</i>	
Use current licensing powers to impose restrictions on abstraction licences and ensure environmental protection on the Cringle Brook.	Agency	Appropriate protection to the river environment, with minimal impact on Anglian Water's operation and costs. Compensation costs would have to be considered.	

**Issue 1b:** There is a concern regarding the sustainability of proposals to restore for navigation purposes the Slea Navigation and the Horncastle Canal.

### Background

Local action groups are seeking to restore the Slea Navigation and Horncastle Canal, to facilitate boating, recreation, improved amenity and add environmental value.

We support river levels in the River Slea in Sleaford via an augmentation borehole. The quantities this can provide are suitable for maintaining levels through Sleaford for amenity purposes only.

Any restoration of the Horncastle Canal and / or Slea Navigation must fully address flood defence, water quality and conservation concerns, however our overriding concern is the lack of water resources for use in the restoration. Any proposal for restoration would have to address the availability of water to make navigation feasible.


### Effects

Local water resources in the catchments of the Slea and Bain are scarce in summer months and cannot sustain any increase in abstraction. We will continue to give consideration to feasibility proposals provided the above concerns are addressed.



*Horncastle Canal*



Options	Responsibility	Comments	Theme
<p><i>Investigate the options for making available water resources and methods of saving and recycling water by:-</i></p> <p><i>(i) Interested parties commissioning investigations which will determine the availability of water, the time it is available and the consequences of abstracting it, in terms of impact on the environment, other users and uses of water resources.</i></p> <p><i>(ii) Agency considering proposals put forward by interested parties and providing input as required.</i></p> <p><i>(iii) Conservation bodies providing information as requested.</i></p>	<p><i>Interested Parties Agency</i></p> <p><i>Agency</i></p> <p><i>English Nature Trust's</i></p>	<p><i>Enable schemes to be Formulated which are sustainable from a water resources view point and do not derogate other water users and uses unacceptably.</i></p> <p><i>Ensure water is used in a sustainable way.</i></p> <p><i>Maximise environmental benefit</i></p>	





## 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 seventeen 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 and species associated with river and wetland habitats.**

### Background

Progressively, over the last three hundred years, developments in land drainage techniques have led to the conversion of the productive, easily worked, alluvial soils of fen and valley bottom to our current intensive agricultural industry. Today only limited areas of wet meadow, marshes, fen and carr can be found alongside watercourses where once they would have been abundant. The need to defend industrial, commercial, residential and agricultural developments from flooding has largely removed the intimate contact that the water once had with the flood plain. This has degraded the wetland habitats by the need for canalisation and flood defence works that have involved the widening and deepening of channels and the construction of embankments.

All wetland species, and the habitats they are dependent upon, require a reliable supply of water to be sustainable. The management and apportioning of the valuable water resource can impact adversely on the diversity and distribution of species, particularly during periods of high levels of abstraction and drought.

Habitat is fundamental to the presence of a wide range of dependant fauna and flora, and as Biodiversity Action Plans are developed, its maintenance and creation will be a significant factor to their success. Wetland habitats are ecologically sensitive, dependent on water input from surface and groundwater and 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 otters, toads, harriers and warblers. Fens reedbeds and wet grassland are some of the habitats listed as 'high priority' in the UK Biodiversity Action Plan.







Some of the habitats and species to be included in the Lincolnshire Local Biodiversity Action Plan include: -

Reedbeds	Great crested newt
Rivers canals and drains	Reed bunting
Springs and flushes	Water Vole
Wet woodlands	Witham orb mussel
Ponds	Spined loach

### Effects

The reduced number of wetland sites throughout the catchment along with their fragmented nature has put a great deal of pressure upon species associated with this type of habitat such as water vole, otters, breeding waders, water-violet and dragon flies.



Options	Responsibility	Comments	Theme
<i>Help prepare and implement Local Biodiversity Action Plans for river and wetland species and habitats.</i>	<i>Agency, County Biodiversity Action Plan groups.</i>	<i>Focused conservation work to benefit threatened species and habitats.</i>	
<i>Collaborate with landowners and conservation bodies to consider restoration and recreation of wetland habitats.</i>	<i>Agency, landowners, FWAG, FRCA, LTNC</i>	<i>Conservation and enhancement of wetland habitats. Increases the resource. Benefits endangered species such as otter and marsh harrier.</i>	
<i>Introduce habitat enhancements during both routine maintenance and capital works.</i>	<i>Agency, IDBs</i>	<i>Further duties to conservation in the catchment, leading to increased biodiversity.</i>	
<i>Develop specific habitat enhancements to increase the range and colonisation of the otter and water vole.</i>	<i>Agency, IDBs</i>	<i>Ensure that current populations are not lost through fragmentation. Conservation of the otter, water vole and other species.</i>	
<i>Develop techniques and methodologies to establish flow requirements needed to sustain the ecology of water courses.</i>	<i>Agency</i>	<i>Better management of the water resource for the needs of the natural environment.</i>	
<i>Promote the establishment of buffer strips and 'zero application zones' alongside watercourses.</i>	<i>Agency, MAFF, FRCA, FWAG, landowners</i>	<i>Reduction in level of phosphates, nitrates and other agricultural inputs entering watercourse. Greater aquatic plant diversity. An improvement in habitat quality in corridor of watercourse.</i>	

## **Issue 2b**

**The introduction of invasive alien plant and animal species threatens the ecological diversity of our natural environment.**

### **(i) Alien plants**

#### **Background**

Invasive species that have colonised habitats along river corridors and in wetlands in the Witham Catchment include giant hogweed, Japanese knotweed and Himalayan balsam and swamp stonecrop. Their populations may be at a level where control is still feasible and opportunities to effect control should be taken wherever possible.




It is important to appreciate that no one single organisation can tackle this issue. Practicalities and resource implications dictate that it be tackled by a number of relevant organisations in partnership.

Since being introduced into Kew Gardens from Japan, Taiwan and Northern China in around 1850, Japanese Knotweed has spread rapidly throughout the UK, particularly colonising along railway and canal embankments and river and stream corridors. The statuesque and ornamental giant hogweed from the Caucasus on Eastern Europe's borders with Asia, rarely caused a problem in the wider countryside until the early 1970's, although its seeds were sold to gardeners as early as 1849. It was in 1970 that the first reports were made that the irritant chemicals in the sap of giant hogweed, furocoumarins, were making the skin hypersensitive to bright sunlight and causing burn like blisters. Since then it has rapidly expanded its range throughout the country. Due to their aggressive dominance and difficulty to control both Japanese knotgrass and giant hogweed have been added to the list of plants for which it is an offence to introduce into the wild under the Wildlife and Countryside Act of 1981. Himalayan balsam was introduced into gardens as long ago as 1839 from the foothills of the Himalayas. It soon naturalised in the West Country, particularly along watercourses, and has since an upsurge in the 1960's, spread north and east. Despite its ability to escape from gardens and aggressively colonise the wider countryside it is still being sold for its attractive foliage and flowers.

#### **Effects**

These introduced species are out-competing native species of plant along riverbanks and local nature reserves. This reduces the diversity of our native flora. The dominance of many of these aliens, which die back in winter, over less vigorous native species, that maintain a tight sward throughout the year, can lead to bare banks prone to erosion by winter flows. The volume of material produced at autumn die-back can clog channels down stream of areas where these plants dominate. Dense stands often impede access to the riverbank leading to difficulties and added expense during routine maintenance and curtailing leisure and recreational activities. Just brushing up against the massive stems of the giant hogweed often seriously blisters people working in the countryside or enjoying it for pleasure.



Options	Responsibility	Comments	Theme
<i>Identify sites where invasive plant species have become established.</i>	<i>Agency, landowners, Local Authorities and other relevant organisations</i>	<i>Improved knowledge of the extent of invasive plant species.</i>	
<i>Develop a strategic approach to implementing appropriate control measures.</i>	<i>Agency, landowners, Local Authorities and other relevant organisations</i>	<i>Effectively halt the spread of invasive species through the catchment .</i>	
<i>Publicise the risks associated with the spread of invasive plant species.</i>	<i>Agency and other relevant organisations</i>	<i>Make landowners, plant retailers and the general public more aware of the threats posed by certain species.</i>	



**Himalayan  
Balsam**







## ii) The American Mink

### Background

The American mink has been establishing itself along watercourses in Britain since the 1950s. Reports of the colonisation of the Witham Catchment by mink suggest that they are locally on the increase. Predation by the mink has played a significant part in the acceleration of the decline in the population of native water vole.

### Effects

Currently sustainable populations of water vole are to be found throughout the Catchment. These populations would be placed under threat 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 its inclusion on the Wildlife and Countryside Act. There is some evidence that the extent of high quality riparian habitat such as expansive reedbed and diverse marginal zones does mitigate the impact of mink predation.

Options	Responsibility	Comments	Theme
<i>Assess the distribution of American mink in relationship with the distribution of water vole.</i>	<i>Agency, Wildlife Trust, MAFF/FRCA</i>	<i>Prioritise effort for the control of mink and the protection of water voles.</i>	
<i>Help in the preparation and implementation of Local Biodiversity Action Plans for the water vole and wetland habitats.</i>	<i>Agency, IDBs County BAP Groups, Landowners. Local interest groups</i>	<i>Protection of the water vole and other species.</i>	
<i>Promote discussions with FRCA regarding the control of mink by landowners.</i>	<i>FRCA, Agency, Landowners</i>	<i>Help to protect the water vole.</i>	
<i>Introduce habitat enhancements during both routine maintenance and capital works.</i>	<i>Agency, IDBs</i>	<i>Increases opportunity for the water vole to naturally resist impact from mink.</i>	



### iii) Signal Crayfish




#### Background

The native crayfish (*Austropotamobius pallipes*) is a threatened species, protected by both UK and EC legislation, and one of the UK Biodiversity Action Plan 'priority species'. It is particularly threatened by the introduced species, the signal crayfish, which is also present in the Witham catchment. The signal crayfish can carry 'crayfish plague', which is particularly virulent amongst the native population, and competes with it for food and habitat. Habitat modification and management of rivers are also factors causing loss or decline in populations.

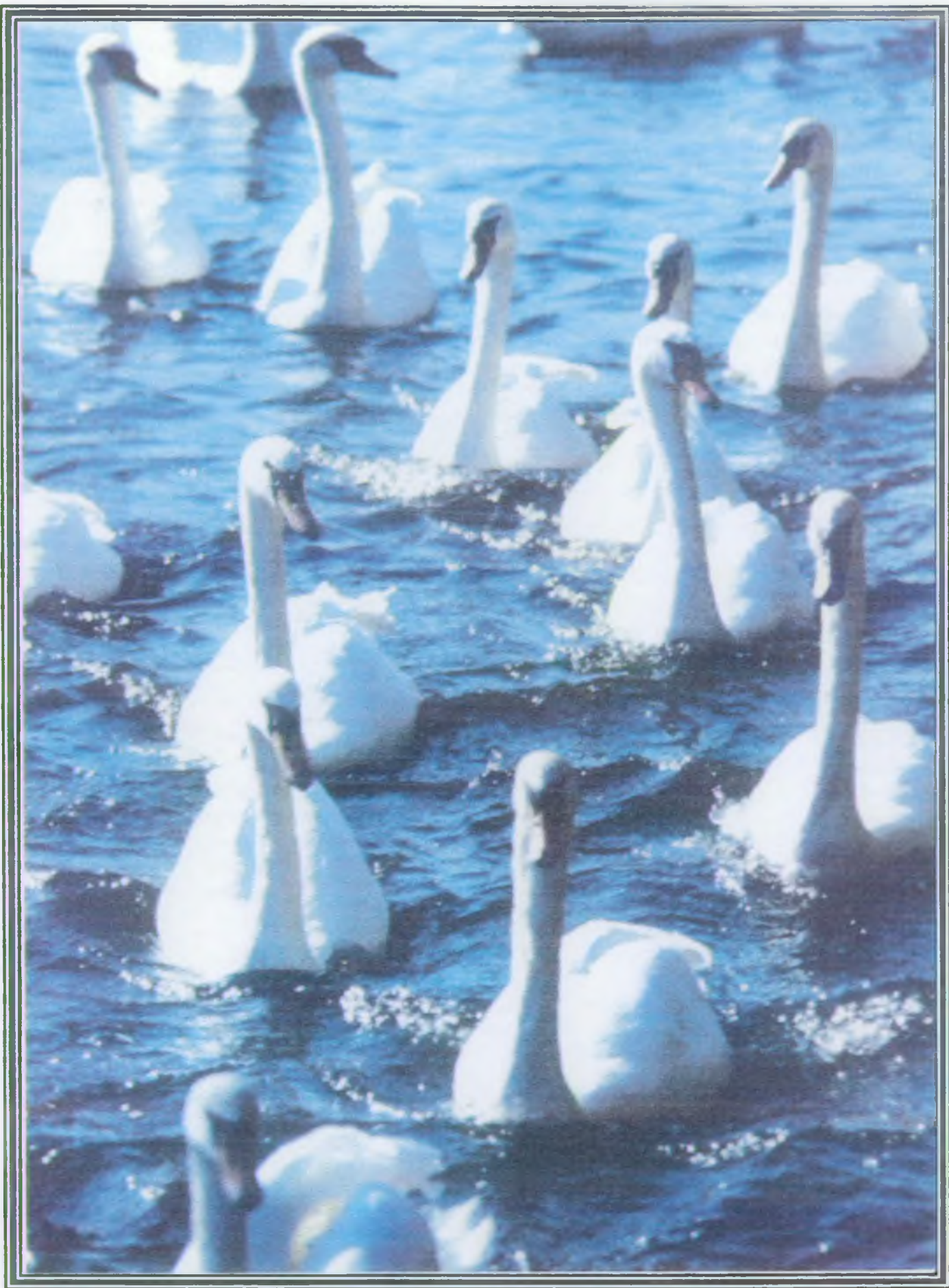
In 1996 an Order under the Import of Live Fish Act 1980 was made affording some protection to the native crayfish by prohibiting the keeping of alien crayfish without a license. To allow for the development of crayfish for the food market exceptions to this Order, in respect to the signal crayfish, were made. This has led to areas within the catchment needing to comply with the requirements of licensing whilst adjacent areas have no such restrictions.

#### Effects

Competition from non-native species, disease and damage to habitat, places the native crayfish population in the catchment under serious risk of extinction. Some local populations of native crayfish have already been eliminated by the introduction of the alien signal crayfish. Areas on the Upper Bain no longer have populations of the native white-clawed crayfish since the colonisation of their habitat by signal crayfish.

Options	Responsibility	Comments	Theme
<i>Establish closer links with conservation organisations to assess and monitor the spread of non native species.</i>	<i>Agency, English Nature, MAFF</i>	<i>Assist in restricting the spread of non-native crayfish (avoiding consequent impact on native species) and maintain ecological balance. There is no statutory obligation for fish farmers to consult with the Agency or English Nature when considering rearing crayfish.</i>	
<i>Produce a Catchment strategy on native crayfish conservation.</i>	<i>Agency, English Nature, Local Wildlife Trusts</i>	<i>Will protect and conserve the remaining native populations.</i>	
<i>Develop and implement Local Biodiversity Action Plans.</i>	<i>Agency, Local Wildlife Trusts, Local Authorities, County BAP Groups</i>	<i>Will protect and conserve the remaining native populations.</i>	







### 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.



*Kikby-on - Bain*

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

### Background

Falling catches of fish, reported by anglers, is causing considerable concern to the fishing fraternity. Speculation regarding the cause of this perceived decline centres on the claim that the River Witham has become so clean that fish populations are declining. The supposition being that the clean up of industrial and water industry discharges is reducing the levels of nutrients in watercourses needed by young fish. It is suggested that this is having an effect on the numbers of fishermen joining angling clubs.

The Agency carried out a routine fisheries survey on the River Witham last year from Lincoln downstream to Boston. This survey was the sixth routine fisheries survey, previous studies being completed in 1982, 1985, 1988, 1991 and 1994. This series of snapshot studies has given us an insight into the status of the fish stocks in the Witham and helps us identify changes that might adversely affect angling success.

Our findings were as follows:





- 29 routine survey sites were sampled during the summer of 1998 on the main river and sites with open connections to the Lower River Witham.
- In total 29,790 fish were caught, representing 18 different fish species.
- Roach were the dominant species caught both in terms of number and weight, followed by common bream.
- Whilst results at individual sites invariably show quite large differences, when comparable sites are considered between 1994 and 1998 the mean fish biomass has changed little: 27.3 g/m<sup>2</sup> (1994) to 26.7 g/m<sup>2</sup> (1998).

To consider roach (the most popular angling species on the river) at all sites sampled back to the early eighties the mean biomass has remained remarkably constant.

Year	Roach Mean Biomass gm <sup>-2</sup>
1982	7.54
1985	6.67
1988	6.26
1991	6.93
1994	6.83
1998	6.41



Our survey and angling results over the last two years indicate that fish distribution within the system may play an important part in helping to explain recent angling form. During our 1998 investigation large numbers of fish were caught in some of the downstream sections towards Boston and it is interesting to read that the same trend appears now with "double figure mixed bags of perch, roach and skimmers" being taken from this area recently.

Options	Responsibility	Comments	Theme
<i>Undertake further detailed assessment of fish biomass levels.</i>	<i>Agency</i>	<i>This will help improve current understanding and illustrate in greater detail the position with respect to fish biomass levels.</i>	
<i>Increase fish and other monitoring of the River Witham</i>	<i>Agency</i>	<i>Increased monitoring will help improve the current understanding with respect to fish populations in the River Witham.</i>	
<i>Explain our findings / conclusions to anglers to allay their concerns</i>	<i>Agency</i>	<i>Valuable liaison which will result in feedback into the process to ensure this issue is resolved.</i>	
<i>Review available match angling return data.</i>	<i>Agency Angling Clubs</i>	<i>Increased information on fish populations will help illustrate the current position.</i>	

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

**Background**

Since the draining of the Fens in the sixteenth century much of the River Witham and many of its tributaries have been engineered with the dual purposes of draining agricultural land and to provide the efficient relief of floodwaters. The resultant nature of these watercourses is generally one of long, often straight lengths of embanked channels with little gradient and trapezoidal in form with few features that would otherwise benefit fish and associated flora and fauna.

Although the fish population has in many ways adapted to this “unnatural” environment problems exist:

- The lack of marginal vegetation and tree cover denies fish their need for shelter and shade;









- The largely uniform river bed gradients of fenland rivers and the lack of deeper holes denies the refuge required by fish during spate flows and cooler deep water during summer months;

- Saline intrusion periodically occurs exacerbated by low flows (low rainfall and abstraction)

- Eutrophic conditions (**Issue 4f**) lead to extreme ranges of oxygen levels in rivers, prolific plant and algal growth and increased sedimentation causing distress to fish and creating adverse conditions for breeding.

These problems are exacerbated in some drains by the practice of lowering water levels during winter months to ensure flood storage capacity is available in the event of high flows. Often the deepest areas in the pumped systems are around and immediately upstream of the pumping station. Here 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 become lowered artificially vulnerable to predators and pollution incidents.



Options	Responsibility	Comments	Theme
<i>Increase habitat diversity in association with flood defence schemes: viz *marginal habitat, *wet berms *meanders *riffles</i>	<i>Agency</i>	<i>Would improve overall environmental value of the river environment with corresponding benefits for fish populations.</i>	 
<i>Construct and monitor the effectiveness of fish refuges.</i>	<i>Agency</i>	<i>Will provide areas where fish can escape flood flows and being washed out to tide.</i>	 
<i>Investigate methods of, and sites for, installation of novel artificial refuges.</i>	<i>Agency , IDBs, Landowners</i>	<i>Develop confidence in cost efficient and effective installations.</i>	
<i>Promote more sympathetic management regime of river levels.</i>	<i>Agency , IDBs</i>	<i>Benefits both riparian flora and fauna and associated fish populations.</i>	 
<i>Evaluate the effectiveness of deterrents at pumping stations.</i>	<i>Agency , IDBs</i>	<i>May offer protection to fish populations.</i>	

**The upstream and down stream free passage of fish is restricted by weirs, locks and other impoundments, which also alter the aquatic environment.**

### **Background**





Obstructions and barriers prevent the free passage of fish species such as brown trout, barbel, chub, grayling and eel that need to move freely throughout a river system during certain stages of their lifecycle. Fish need to migrate for many different reasons, examples are for spawning, feeding and avoidance of pollution and predators. Restriction on movement because of artificial barriers can have an adverse influence on the natural distribution of fish populations. Brown trout and grayling have been particularly noted as being under threat by being included on the UK Biodiversity Action Plan as Species of Conservation Concern and as being impacted upon by barriers to migration.

Areas upstream of impoundments may no longer reflect the habitat and species expected from the river type and topography. Impacts on the dynamics of a watercourse affect the transportation of suspended solids leading to changes to the flora and fauna upstream of impoundments. This is particularly apparent where the impoundment is creating a large difference in water level, which can be over 2m on the upper Bain and Witham.

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

### **Effects**

Barriers have restricted the movement of migratory fish species, impacting directly on the diversity and density of all those species. Impoundments, particularly on the upper reaches of the Bain and Witham, have influenced the geomorphology of the watercourse and its associated habitats.

Options	Responsibility	Comments	Theme
<i>Install fish passes at appropriate existing and new control structures.</i>	<i>Agency, IDBs</i>	<i>Ensure fish migration is able to take place when necessary. Improved fish biomass and species diversity. Assists with meeting BAPs targets.</i>	
Restock rivers with fish	Agency, fishery owners	Improved fish biomass and species diversity Not sustainable	
<i>Identify opportunities for removing/modifying existing structures so improving the up stream ecology, particularly on the upper River Bain and upper River Witham.</i>	<i>Agency, landowners</i>	<i>Improve the ecological status of the river system and its associated wetlands.</i>	 



*Navigation structure impeding the passage of fish*





*View over the Lincolnshire  
Wolds*

#### 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.

##### 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.**

##### Background

The countryside has always been an attractive area for the enjoyment of leisure pursuits. The corridors of watercourses are an obvious part of the wider countryside that can accommodate many differing activities from angling and boating to bird watching and cycling. The Agency actively promotes such interests, however increasing pressure to absorb a greater intensity of traditional pursuits and to accept new ones can lead to conflicting impacts on water resources, water quality, flood defences, habitats and flora and fauna.

An associated problem also exists with respect to the Witham navigable drains, these drains which include lengths of the Hobhole and Maud Foster / Stonebridge Drain system are promoted for further recreational development however the navigational responsibility for these systems is uncertain.






## Effects

Without a strategic approach to the development of leisure activities, initiatives could become stifled, possibly at the expense of minority groups. Impacts on existing users, the natural environment and a reduction in opportunity for the leisure needs of the public could result.

*Access along the river bank  
provided by the Agency*



Options	Responsibility	Comments	Theme
<i>Improve liaison between user groups</i>	<i>Users and potential users, Land owners Local Authorities' Agency, BW</i>	<i>To achieve an understanding of each other's needs.</i>	
<i>Conduct Environmental Impact Assessment of all developments in leisure use along the R Witham .</i>	<i>Developers Local planning authority</i>	<i>Ensures impact upon existing water users is considered Protects habitats and species within the corridor.</i>	
<i>Commission a historical assessment of navigation responsibilities in the Witham navigable drains.</i>	<i>Agency, IDBs, IWA, BW</i>	<i>Define responsibilities for control and future development within the system.</i>	

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

### **Background**

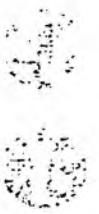

The proximity of an activity to a groundwater abstraction is one of the most important factors in assessing the risk to an existing groundwater source. All sources, including springs, wells and boreholes, are liable to contamination and need to be protected. Three groundwater Source Protection Zones are recognised:

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

In 1993 the RAF found that there had been a leak from a faulty valve and pipework. Initial estimates 35,000 litres of aviation fuel had escaped into the aquifer. A remediation scheme was commissioned using a network of boreholes to inject air to accelerate the biodegradation of the fuel. This programme of work achieved the removal of an equivalent volume of fuel.

In 1998 a further leak of some 15,000 litres into the ground was detected. Additional techniques are being employed to remove free product from the boreholes.

The site is on a major aquifer in a zone III source protection zone.

<b>Options</b>	<b>Responsibility</b>	<b>Comments</b>	<b>Theme</b>
<i>Remediate the site and continue to monitor extent of pollution.</i>	<i>RAF Agency</i>	<i>Removal of contamination and continued protection of the groundwater resource.</i>	
<i>Raise the awareness and provide advice to others.</i>	<i>Agency</i>	<i>Reduction of risk of future pollution incidents.</i>	



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

## **Background**

Ground water is highly vulnerable to diffuse sources of pollution. Agricultural practices, ie, the use of fertilisers, between Grantham and Lincoln, where the Lincolnshire Limestone aquifer outcrops, have contributed to the presence of high concentrations of nitrate in ground waters. Surface waters in the Plan area are also adversely affected by high nitrate concentrations as a result of run-off from agricultural land.

A voluntary pilot scheme of Nitrate Sensitive Areas (NSAs) was introduced in 1990 to test the effectiveness of restrictions on farming practices in reducing nitrate levels in water. Within this LEAP area three NSA's existed, Sleaford, Aswarby, Branston Booths. These programmes ran for five years from the application date. Farmers who took up the scheme were expected to carry out measures beyond Good Agricultural Practice. This scheme is to be phased out by 2003.

In 1998 the Action Programme for Nitrate Vulnerable Zones (NVZ) (England and Wales) Regulations was introduced which set rules which must be followed by farmers in certain areas, where nitrate concentrations exceed, or are at risk of exceeding the EC Nitrate Directive limit of 50 mg/l.

Funds to compensate farmers for changing their farming practices were available under the voluntary NSA scheme. These programmes ran for five years from the application date and farmers were expected to carry out measures beyond Good Agricultural Practice. The final date for receipt of applications under the scheme was September 1998. Those made in 1998 will therefore expire in 2003.

With the implementation of the NVZ Regulations, NSAs have now been superseded. NVZ rules are compulsory, based largely on Good Agricultural Practice and farmers will receive no compensation. However, grants for farm waste storage facilities are available. All areas of land previously designated as NSAs are now part of the larger NVZs. Individuals who previously did not enter the voluntary NSA scheme are now required to comply with the NVZ rules. Where the rules overlap, the more demanding of the two applies.

An area around the upper stretches of the River Witham, in the catchment of the Cringle Brook and part of the Lincolnshire Limestone outcrop have been designated as the River Witham and Lincoln NVZs respectively.

There is a perception that when the NSA scheme expires areas of land put to grass will be returned to arable and that this will lead to 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 nitrate. 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 will continue.

The area converted to grassland in the Plan area was approximately 25% of the total incorporated in the scheme.

## Effects

Agricultural practices have been the major contributing factor to nitrate concentrations exceeding EC Drinking Water Directive (and also the Nitrate and Surface Water Abstraction Directive) limit of 50 mg/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.

Locally the River Witham at Saltersford Footbridge and the Cringle Brook at Thunder Bridge fail the nitrate standard for the Surface Water Abstraction Directive.

Options	Responsibility	Comments	Theme
<i>Introduction of regulations to require farmers to follow action programmes</i>	<i>Farmers Farming Advisors Environment Agency</i>	<i>The amount of nitrate leaching through soil into ground and surface water should be minimised.</i> <i>Farmers will have to change practices eg. maintaining records of nitrate input from both organic and inorganic sources.</i>  <i>Should improve nutrient management by farmers.</i> <i>No compensation given to farmers.</i> <i>Should be economic benefits for making maximum use of nutrients applied.</i>	  



**Issue 4d: Contaminated land sites have the potential to cause further pollution and harm to human health.**

### **Background**

Land may become contaminated by former industrial practices such as gas production or manufacture / storage of chemicals for example. At the time of use these practices may well have been acceptable under less stringent legislation however, as a consequence a legacy of areas needing to be cleaned up in order that they can be used again in the future safely and without risk to human health or pollution.

The Agency favours the beneficial re-use of contaminated land in preference to the development of green field sites, provided that pollution is not caused. Sites have been cleaned up with the help of derelict land grants and many smaller sites are cleaned up by developers seeking to build upon them. However, serious problems are experienced with "orphan" sites where the owner is not known, or the resale value of the cleaned-up site is less than probable remediation costs.

The contaminated land provisions of the Environment Act 1995 are due to come into force in December 1999. The legislation will require that land defined as contaminated must be remediated so that it is suitable for the intended end use.

A number of sites in the Witham catchment are contaminated including:

#### **Former Boston Gasworks**

The site has been shown to have high levels of cyanide contamination. Workmen have been taken to hospital following works adjacent to the site whilst excavating a trench. Some contamination has been removed but further works will need to be undertaken with great caution. A school is scheduled to open on adjacent land in 1999.

#### **St Marks Lincoln**

In 1989 the former bus depot at St Marks in Lincoln was found to have suffered from extensive leakages of diesel. It was feared that a vast quantity had escaped over the years. The site is adjacent to the River Witham but does not appear to have had any deleterious effect, perhaps due to extensive sheet piling providing a barrier to its movement. The landowner, Barclays Property Investment, commissioned a remediation scheme involving a network of boreholes and associated pumps designed to recover the diesel. 34,500 litres of diesel has been recovered. The scheme was originally to end in 1999 and a risk assessment will be undertaken to establish whether there is a need for ongoing remediation. The site is on a minor aquifer consisting of superficial sand and gravel and it is reported that the contaminant is now relatively immobile.

#### **Skewbridge**

Redevelopment schemes are being evaluated for the former landfill site at Skewbridge in Lincoln. The site was a major disposal facility serving the city of Lincoln and area in the late 60's and 70's. It covers some 22 hectares and has up to 3 metres depth of household

commercial and industrial waste. Hazardous substances including asbestos were disposed of there and works to remediate the site will require particular caution. The position of the landfill in relation to the Swanpool and connected surface waters compound the complexity of remedial options.

### **Lincoln Gas Works**

The Environment Agency were advised by North Kesteven District Council that a blue substance had been observed on the surface at derelict land next to the main gas works after heavy rainfall. Later laboratory analysis revealed that the blue contaminant was ferric ferro cyanide (blue-billy). The site has now been capped with a clay/topsoil mixture and a detailed Site Investigation with associated Risk Assessment is to be performed. The Environment Agency are currently advising the Project Team, which is being headed by North Kesteven District Council.

<b>Options</b>	<b>Responsibility</b>	<b>Comments</b>	<b>Theme</b>
<i>Undertake the inspection of land in their areas and compile a register.</i>	<i>Local Authority</i>	<i>Will determine the presence of sites which fall under the definition of contaminated land.</i>	
<i>Issuing of remediation notices.</i>	<i>Local Authority</i>	<i>Will require clean-up of contaminated sites to protect the environment and human health.</i>	
<i>Regulation of Special Sites.</i>	<i>Local Authority Agency</i>	<i>Remediation of contaminated sites.</i>	
<i>Remediate the site in conjunction with redevelopment schemes.</i>	<i>Landowner, local authority, Agency</i>	<i>Remediation is carried out. Land is put to economic use.</i>	



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

**Background**

The Agency assesses water quality against a series of targets and objectives which have been set to provide a defined level of protection for aquatic life and other uses. The River Ecosystem (RE) scheme (see Appendix 3) provides, on a National basis, a set of chemical water quality targets which we use as a basis for setting consents to discharge and in undertaking other water quality planning activities.

**Effects**

A number of river stretches in the catchment fail to achieve their River Ecosystem target classes. Map 1 opposite, shows stretches of river which have not met the target standard, identifying failures as being marginal or significant. Marginal failures are those failures in water quality where we are statistically uncertain as to whether a failure really exists.

The majority of the marginal and significant failures against River Ecosystem targets relate to reduced oxygen concentrations or elevated biochemical oxygen demand. These cannot be related to effluent discharges or specific pollution sources. These failures are due to either eutrophic effects or the 1995-1997 drought as the figures used are over a three year period.

Long term Water Quality Objectives for watercourses representing what we perceive as realistic and sustainable are proposed in Appendix 4. These will form the basis for future Surface Water Quality Objectives for those watercourses which are classified.

**Marginal Failures**

A number of marginal failures against River Ecosystem targets have been identified and are shown on the Map opposite. 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 being marginal to significant. These failures are mostly thought to be due to eutrophication or low river flows.

Gainsborough

Market Rasen

Lincoln

Newark  
on Trent

Sleaford

Grantham

Key:

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

Significant failure

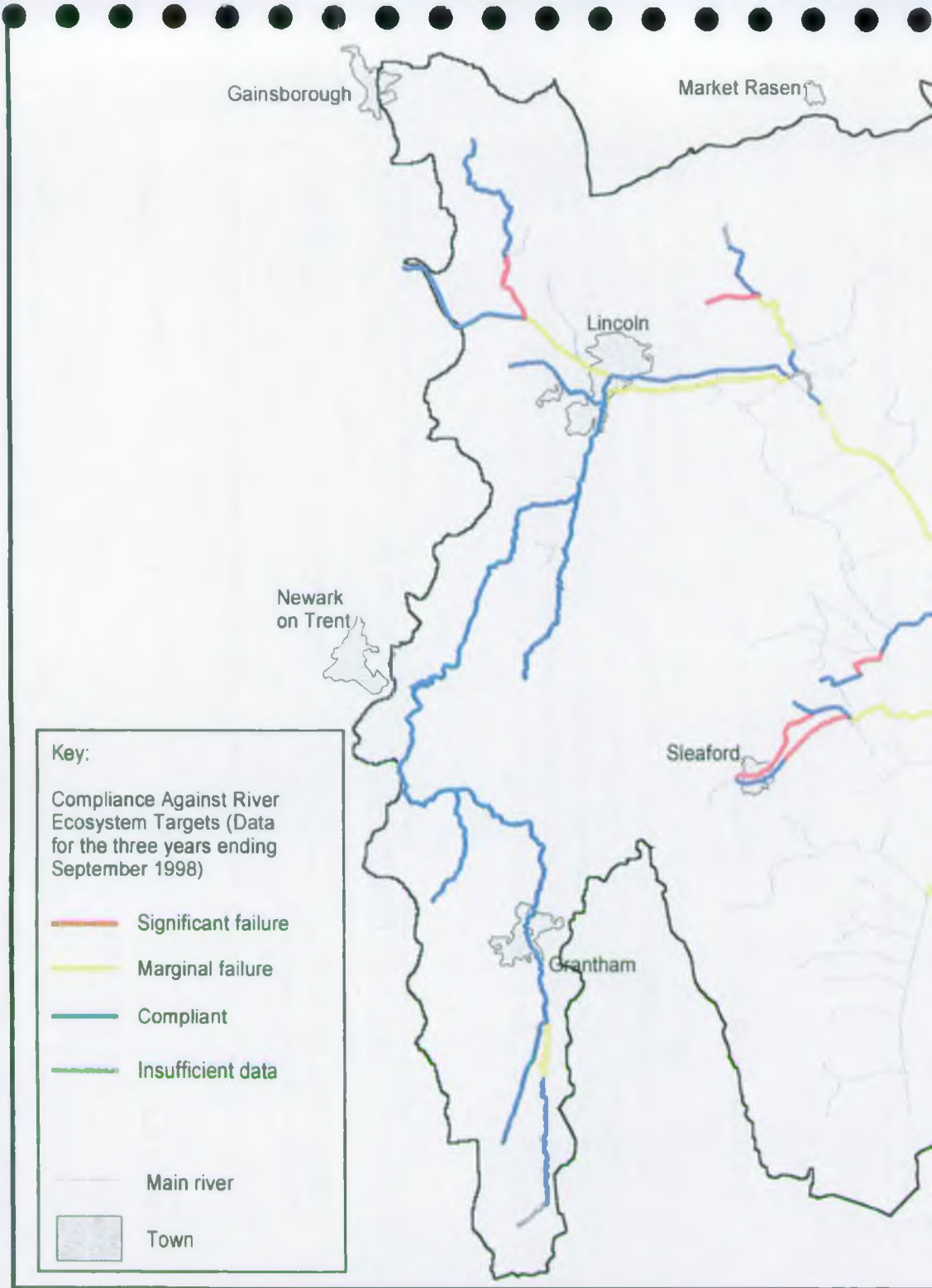
Marginal failure

Compliant

Insufficient data

Main river

Town





**The Witham LEAP**  
**Map 1 Compliance Against**  
**Water Quality Objectives**



**ENVIRONMENT**  
**AGENCY**

## Statistically Significant Failures


(Failing stretches due to specific pollution sources.)

### The Old Slea between Sleaford STW and Cobblers Lock

The Old Slea is adversely affected by ammonia contamination from the Sleaford Sewage works. This site has an intermittent long term biological failure. This is a longstanding problem and has been identified for inclusion in Asset Management Plan 3 (AMP3). The works will also require measures to be introduced for phosphate removal under the Urban Wastewater Treatment Directive by 2004 (See Issue 4e– Nutrient Enrichment and failures due to eutrophication and low flows).


### Frampton Town Drain – Frampton to New Hammond Beck

Frampton Town Drain is affected by Frampton Sewage Treatment Works. This again is a longstanding problem and the Works has been identified in AMP3. Eutrophication is a factor affecting this watercourse (see failures due to eutrophication and low flows).

Options	Responsibility	Comments	Theme
<i>Carry out capital works at STW to improve effluent quality.</i>	<i>AWS</i>	<i>Downstream water quality improves.</i>	

### Nettleham Beck between Nettleham STW and Barlings Eau

The Nettleham Beck has been adversely affected by ammonia contamination from the sewage works. A consistent and long term biological failure has occurred at this site due to the effluent from Nettleham STW. The scheme to improve the performance of the Works has been completed and the effluent is much improved. There are signs of ecological recovery and monitoring of the watercourse should establish that the works have been successful. This stretch should show compliance when historical failing data no longer falls in the reporting period.

Options	Responsibility	Comments	Theme
<i>Continue to monitor watercourse to confirm compliance.</i>	<i>Agency</i>	<i>Confirms improvement is sustained.</i>	



## Failures due to Eutrophication and low flows

The following stretches recorded significant failures against their River Ecosystem targets due to the effects of high nitrate levels and the demand for oxygen by microcopic organisms (see the following issue) and low flows:

River Till - Kexby Beck to Fosdyke Canal  
Farraway Drain - Anwick Catchwater to Billingham Skirth  
Old Bain - Waring to Horncastle Canal  
Old Bain - Horncastle STW to Dalderby Ford  
Witham – Dogdyke to Grand Sluice  
Old Slea between Sleaford STW and Cobblers Lock  
River Slea between Boiling Wells and Ruskington Beck  
Frampton Town Drain – Frampton to New Hammond Beck  
Stone Bridge Drain – Sibsey to Cowbridge Lock

*Agency staff – sampling  
river quality*





## Other Biological Concerns

The table below reflects lengths of river which fail to meet biological targets.

### Action:

*Investigations are proposed with respect to these sites with a view to considering, whether or not further actions are appropriate.*

River	Location	Comments
Cringle Brook	Downstream of Skillington STW	Consistent long term biological failure. However, recent data reached the target level.
Mow Beck	Downstream of Harlaxton STW (Lake)	Intermittent, occasional serious failure.
Reepham Beck	Downstream of Reepham STW	Intermittent failure to meet biological target. Most recent data however, achieved target. Proposals for improvements already exist as part of the AMP 3 process for this site.
Reepham Beck	Railway Crossing	General biological failure against target, especially since early 1997 and prior to late 1992.
River Bain	Upstream and downstream of Ludford STW	General failure against biological target both upstream and downstream of the STW. Low flows during high summer are experienced.
Scopwick Beck	Kirby Green	Intermittent long term failure against biological target.
Dorrington Catchwater	Upstream and downstream of Dorington STW	Consistent long term biological failure. STW compliant and most recent data (early 1999) shows that this site is currently compliant with its biological target.

**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.**

### **Background**

The quality of most watercourses in the Plan area are adversely affected by eutrophication. Eutrophication arises where human activities, principally surface water run-off from agricultural land and sewage treatment works discharges, cause water to be enriched by nutrients. This gives rise to adverse effects on both the ecology and uses of water.

The Agency has developed a National Eutrophication Strategy to address the issue.

Under the Urban Waste Water Treatment Directive (UWWTD), watercourses which either directly or indirectly receive qualifying discharges (works serving populations greater than 10,000), and fulfil certain criteria set out in DETR guidance can be designated as a Sensitive Area Eutrophic, SA(E). Designation as a SA(E) 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.

### **Effects**

As a consequence of eutrophication, water quality and aquatic communities sensitive to nutrient enrichment are adversely affected. Algal growth can make angling impossible, lead to low dissolved oxygen concentrations and fish mortalities, reduce submerged aquatic weed diversity and cause access problems for boats.

Options	Responsibility	Comments	Theme
<i>Undertake phosphate removal at qualifying Sewage Treatment Works</i>	<i>AWS</i>	<i>Will reduce phosphate inputs to watercourses</i>	
<i>Gather/review data from rivers which show symptoms of eutrophication:</i>  <i>Continue chemical/biological monitoring.</i>  <i>Gather other information on effects of nutrient enrichment.</i>	<i>Agency</i>	<i>Greater confidence in classification of eutrophic status. Increased understanding of potential for eutrophication on process.</i>  <i>Will help identify particular problem areas.</i>  <i>Possible lack of positive outcome – stretches may not ultimately be designated.</i>	
Encourage buffer zones on riparian land.	MAFF, ADAS, Agency, Landowner	Reduces environment impact. Enhances habitat and plant diversity. Potential conflicts of land use interest.	
<i>Investigate benefits of reducing phosphates in other discharges</i>	<i>Agency, Anglian Water Services</i>	<i>Assess requirement for nutrient reduction.</i>	

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

### Background

Traditionally sewage treatment in rural areas has mainly relied upon each dwelling having individual septic tanks. The overflow from such tanks are designed to drain into the soil via a below ground soakaway. In poorly drained areas with clay soils, or where the water table is high, common practice was to drain the tanks to the nearest watercourse. Such discharges contravene current legislation. It is the owners responsibility to ensure pollution does not result from their sewage disposal facility.

Where such watercourses run through the centre of villages, the pollution and smell nuisance



has resulted in the watercourses being piped-in and buried. In such cases, the piped watercourse became known as the 'village drain' or 'sewer' and many were maintained by the local council.

Current legislation enables applications to be made to Anglian Water Services for the provision of a first time sewerage scheme. Applications are considered by AWS and assessed against certain technical and economic criteria. Applications for Swaton near Sleaford and Whisby near Lincoln have been accepted. Applications for Walcott and Fenton have been rejected but may be subject to appeal and decisions are awaited on applications for Hough on the Hill, Broadholme and Pickworth.

### Effects

The problem manifests itself in terms of localised pollution and public health concerns. The effects are worst during periods of dry weather and low dilution flows.

Options	Responsibility	Comments	Theme
<i>Requisition of first time sewerage schemes for villages affected.</i>	<i>Anglian Water Services/Property Owners/Local Authorities / Agency.</i>	<i>Illegal discharges cease.</i>	
<i>Individual householders to provide suitable sewage disposal facilities.</i>	<i>Property Owners/ Agency/Local Authorities.</i>	<i>Illegal discharges cease.</i>	
<i>Co-operative investment in package treatment plants.</i>	<i>Property Owners/ Agency.</i>	<i>Illegal discharges cease.</i>	
Enforcement action taken under relevant legislation	Local Authority	Illegal discharges cease Piecemeal approach to a wider problem.	

**Issue 4h: Water quality of the River Witham, Hobhole Drain, Maud Foster Drain, and South Forty Foot Drain are affected by saline intrusion.**







### Background

During extended periods of low flows, 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 and migrate to upstream stretches however, when the change is too rapid, fish mortalities occur. The flora of the watercourses are also affected. Excessive salinity is a particular

concern for the agricultural industry, as the poor water quality may become unsuitable for spray irrigation purposes. The primary source of this salinity is from leakage around and through tidal structures and through sea banks, although salinity may also arise from "salt-pans". The National Rivers Authority and now the Environment Agency has done much over the years to combat saline intrusion and keep its impact to a minimum, including the use of pumps, bubble curtains and revising its river management procedures.

## Effects

Increased salinity will, over time, result in a change in the flora and fauna of affected watercourses, and their use as fisheries may be compromised. There will be a loss of salt intolerant species and dominance of salt tolerant or brackish water species will occur. Algal blooms of prymnesium may result, posing a threat to fish life through toxic releases to the water environment.

Options	Responsibility	Comments	Theme
<i>Review the effectiveness of work already carried out by the Agency.</i>	<i>Agency</i>	<i>The Agency will establish its current level of understanding with respect to this problem.</i>	
<i>Continue monitoring water quality and consider alternative options e.g.:</i>  <i>* Improving tidal structures,</i> <i>* Improving the effectiveness of pumps,</i> <i>* Raising water levels in drains,</i> <i>* Transferring water from highland into lowland systems.</i>	<i>Agency, IDBs</i>	<i>Improved management information.</i> <i>Improved knowledge of the options and costs of remedial actions.</i>  <i>Expensive option may not be practicable.</i> <i>Short term solution, not a sustainable solution.</i>  <i>Could increase flood risks</i>  <i>Could have a detrimental impact on highland systems</i>	  
<i>Establish a strategy for dealing with saline intrusion for individual watercourses.</i>	<i>Agency, IDBs</i>	<i>Probable long term improvement of water quality with associated benefits to both the environment and other users.</i>	 



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

### Background

Water quality is failing the standard set by the EC Dangerous Substance Directives 76/464/EEC as a result of historic industrial practices in two watercourses in the LEAP area.



### DIELDRIN IN THE NORTH DELPH

The North Delph downstream of Allenby Road Industrial Estate in Lincoln fails the Directive limit for dieldrin. Dieldrin is a persistent organochlorine compound which was used in the formulation of insecticide powder on the industrial estate but was withdrawn from use in 1989. The owner of the land thought to be the source has undertaken significant works to remediate and prevent any further contamination from their site. The failure to meet the concentrations required by the Directive is associated with historic residual contamination.

Options	Responsibility	Comments	Theme
<i>Undertake further work to identify the source of the dieldrin within the surface water system.</i>	<i>Agency AWS Local Authority</i>	<i>Remediation may prove to be possible. May not prove a remediation possibility.</i>	
<i>Continue to monitor and report on the level of dieldrin in the watercourse.</i>	<i>Agency</i>	<i>Level of contamination remains known. Date of compliance with directive is indeterminate.</i>	

### DIELDRIN IN THE TOWNS DRAIN

The Towns Drain in Boston is contaminated with Dieldrin associated with a timber treatment and storage site (Calders & Grundage) in the area. Wood preservatives have leached into the ground and have migrated to the drain. Extensive remediation works have been carried out by Calders and Grundage, including pollution minimisation, site clean up, and provision of a surface water treatment plant. Contamination currently being measured is considered to be slow release from the ground and sediments. Surface water quality having improved dramatically following the remediation works. The concentration of Lindane (gamma HCH) which previously failed to meet the standard is now compliant.

Options	Responsibility	Comments	Theme
<i>Undertake work to identify any further sources.</i>	<i>Landowner, local authority, Agency</i>	<i>Remediation may or may not prove to be possible.</i>	
<i>Continue to monitor level of dieldrin and HCH in the watercourse.</i>	<i>Agency</i>	<i>Level of contamination remains known. Date of compliance with directive is indeterminate.</i>	





## 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 defences on the Witham Haven against flooding is being reduced by rising levels and by bank erosion.**

### Background

Along the Lincolnshire coastline sea levels relative to land levels are rising at an estimated 6mm per annum. The cumulative effect of this to the year 2030 is a 210mm rise in levels. The current defences protecting Boston provide a level of protection for a 1 in 100 year tide event with sufficient freeboard to allow for the rise in levels into the next century. However, in the early part of the 21<sup>st</sup> Century the prospect of raising the defence still higher will have to be considered.




In the more immediate future the Haven channel; which is subjected to tides, wave action and boat wash, is suffering from erosion which, if allowed to continue, will undermine the stability of the defences. A review of the River Witham Outfall Stoning Strategy was completed in May 1996, its main conclusion was to closely monitor the Haven for signs of erosion on a six monthly basis. To date this has not revealed any significant problems.

A mixture of steel piling, brick and concrete walls line the tidal channel through Boston. Some support important flood defences and are maintained by the Agency. Some do not form part of the flood defences and are in private ownership. The condition of these structures is variable, with certain lengths of wall requiring maintenance.

A condition survey of the walls through Boston was completed in June 1996. The result of the report was the undertaking of grouting works at Edwin Street to prevent seepage and ultimately undermining of the wall, the repairs of the brickwork at South Quay and piling work along South Terrace.

### Effects

The effects of rising sea levels and bank erosion is to effectively reduce the level of protection provided by the existing defences. Should they not be maintained then they will fail. Both scenarios will result in the town of Boston being effected to some degree from tidal flooding in the future.

Options	Responsibility	Comments	Theme
<i>Provide appropriate and effective tidal defences for the long term.</i>	<i>Agency MAFF</i>	<i>Indicative targets for Flood Defence provided. Long term security for people and property. Possible environmental disturbance.</i>	
<i>Monitor and maintain existing defences and initiate repairs /replacement as required.</i>	<i>Agency</i>	<i>Maintain the integrity of flood defences. Repairs are undertaken at most beneficial times Long term reduction of flood defence standards.</i>	
<i>Advise others of their responsibilities.</i>	<i>Agency Riparian owners</i>	<i>Ensure all owners are aware of their responsibilities and importance of structures.</i>	



**Issue 5b:        The standard of flood defence along the lower River Witham and its tributaries do not meet target standards.**

## **Background**

The flood defence standards for lengths of Lower Witham between Lincoln and Boston including its major tributaries are below Agency Standards of Service targets (See map over). This has arisen in part as a consequence of the high flows the Witham has experienced in recent times due to the changes in the catchments characteristics.

A Strategy Study was published by the Agency in 1997. It recommended a strategy that would result in the level of service reaching a required minimum level of service throughout the Catchment. However, where necessary urgent or emergency works would be undertaken to maintain continuity of the defence ahead of implementation of the full Strategy. For example, anti-seepage and embankment stabilisation works have been completed at sites on the Lower Witham at Bardney and Blankney Fen.

The Witham – Downstream of Lincoln (Stamp End Lock) the current flood defences provide less than the indicative standard as defined by MAFF and the Agency. A strategy has been submitted to MAFF for agreement in principle.

Where conditions have warranted such action, urgent works have and will be progressed ahead of the Strategic works to ensure the continued integrity of the defences.

Barlings Eau – Has experienced embankment breaches and flooding on occasions during past high flow events. Works to ensure their continued integrity are programmed to commence once the Strategic Study has been agreed.

The River Bain – Downstream of Horncastle the current flood defences provide less than the indicative standard especially in the villages of Haltham and Kirkby-on-Bain. Works to ensure their continued integrity are being investigated.

Horncastle comes under threat from three sources during periods of high flow and rainfall. Should the Bain and Waring be running at a high level, outfalls from IDB and surface water sewers can not discharge, back up and flood areas away from the Main River.

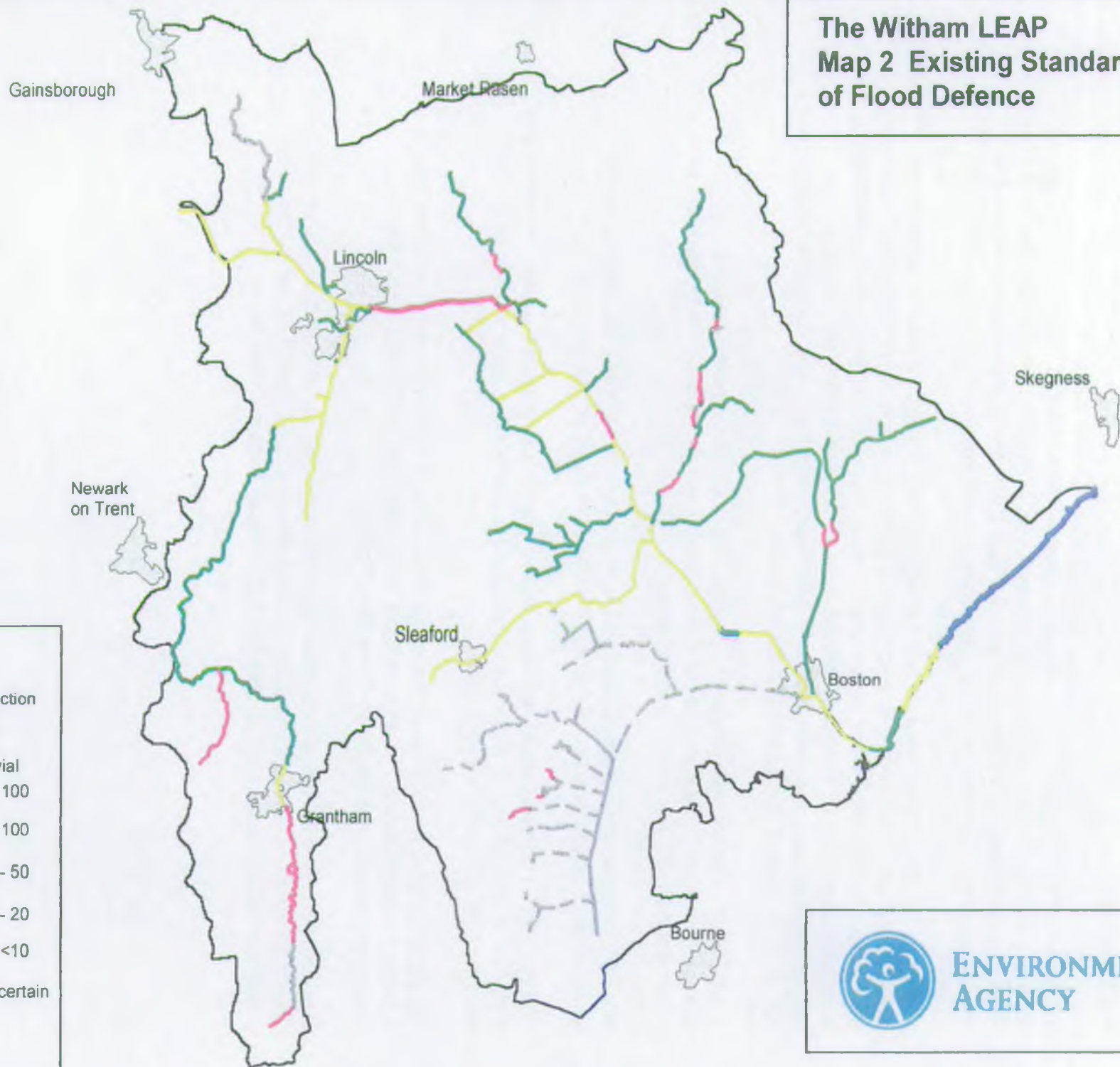
# The Witham LEAP Map 2 Existing Standards of Flood Defence

## Key:

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

Town



ENVIRONMENT  
AGENCY

## Effects

Failure to meet target standards will produce a reduced standard of defence increasing the risk of flooding at times of extreme stress.

Options	Responsibility	Comments	Theme
<i>Develop and Progress flood defence strategies for the:</i>  <i>"Lower" Witham River Bain.</i>  <i>Undertake urgent works as necessary</i>	Agency	<i>This will ultimately provide flood defence benefits for people and property.</i> <i>Environmental enhancement opportunities may arise.</i> <i>Some compromise in flood defence standards may have to be accepted, if the costs of proposed schemes exceed anticipated benefits.</i>	
Undertake works on "piecemeal" basis.	Agency	Work not undertaken in the most economically efficient order. Environmental enhancement and opportunities may be missed.	

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

### Background

The South Forty Foot Drain and its tributaries and the River Witham through Grantham have benefited from major capital schemes in the past. However, during the last 20 –30 years the standard of defence provided by the channel and associated structures may have deteriorated.

The Agency does not presently hold detailed hydraulic information of the Catchment, or its structures, in sufficient detail to establish current performances or standards of service.

(i) Grantham – last received the benefit of a major improvement scheme in the 1970's. The effect of development within the area (see issue 5g) and the condition of the defences needs to be defined.

The last scheme was designed to provide a defence against a 1 in 30 year event. The current indicative standard of defence for an urban area such as Grantham is 1 in 100 year. Whilst it is thought possible to carry such flows through the town, the channel and structures are not






designed to do so.

(ii) The South Forty Foot Drain and its tributaries serve a large fen subcatchment south and west of Boston. The Black Sluice Pumping Station which discharges flood waters from this system, with its pumps and gravity outfalls, is reaching the end of its design life. A number of the tributary highland carriers have experienced out of bank flow, since Christmas 1997 and most recently in March 1999 when there was a breach of the South Forty Foot Drain itself.

Due to flooding which originated from the Billingborough Ouse Mere Lode one of the tributaries of the South Forty Foot a separate investigation has been initiated to determine options that will alleviate any future flooding or high flows.

### Effects

Whilst the Agency carries out regular maintenance inspections, surveys and works, the nature of the defences has resulted in certain reaches not currently receiving a reasonable or sustainable standard of protection. The effect of this is an increased risk of flooding.

Options	Responsibility	Comments	Theme
<p><i>Initiate studies of flood defence standards and develop options to improve:</i></p> <p><b>Grantham</b></p> <p><b>South Forty Foot system.</b></p>	<p><b>Agency</b> <b>Railtrack</b></p>	<p><i>Strategic approval will lead to cost savings.</i></p> <p><i>Opportunity to identify environmental improvement options.</i></p> <p><i>Improved knowledge of system identifies problems. Resulting works will reduce risk.</i></p> <p><i>Long lead in time to projects on a Catchment basis.</i></p>	
<p><i>Review development control policy (ref 5g).</i></p>	<p><b>Local Authority,</b> <b>Agency</b></p>	<p><i>Minimise impact of future development within catchment.</i></p>	
<p><i>Advise others of their responsibilities.</i></p>	<p><b>Agency</b></p>	<p><i>Improved awareness of responsibilities.</i></p>	

**Issue 5d: There is a potential risk to the Fossdyke Canal flood defences caused by the shared responsibility for maintaining the embanked canal.**



### **Background**

The ownership of or responsibility for structures, associated with the Fossdyke Canal, has become confused and disputed over the years. This has largely been resolved. However, there is some dispute over the responsibility for maintenance of the embanked canal. This dispute may delay maintenance work being undertaken to the Canal which could in turn increase the associated level of risk. Should problems occur with structures then a number of parties may become involved in its solution. Each party may have varying degrees of responsibility, hence differing amounts of contribution need to be agreed prior to work commencing on site.

We commissioned a condition survey of the structures that "contain" the Fossdyke. This found that none of the structures under our jurisdiction require urgent attention.

### **Effects**

Should this issue not be resolved the position will remain confused and defences will continue to decline in standard. This will risk defence failure and urgent / emergency repair work in an unplanned fashion.

<b>Options</b>	<b>Responsibility</b>	<b>Comments</b>	<b>Theme</b>
Promote and exercise agreement with majority of those responsible signed up.	BW / Agency / DETR/ Lincoln City Council	Responsibilities clarified to all Parties. Arrangements regarding contributions are agreed. Enables planned investment to meet needs Not all parties sign up to agreement.	
<i>Promote and exercise agreement with all parties that have responsibilities signed up.</i>	<i>BW/ Agency / DETR / Lincoln City Council / Railtrack / Lincolnshire County Council</i>	<i>Responsibilities classified to all parties. Arrangements regarding contributions are agreed. Enables planned investment to meet needs. Lengthy process not all participants may agree.</i>	

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

### **Background**

The Agency will provide advance warning of flooding where it is known to have occurred in the past and where it is physically possible to do so. The warning may not be specific to a particular street or property but will normally apply to a more general but defined area. Whilst warning will not prevent flooding it may alleviate the effects of damage caused by allowing those affected 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
- to take reasonable steps to alert those at risk

To fulfil this role the Agency must ensure that there is: 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 and methods to alert and warn the public when there is a risk of flooding, flood warning plans and associated public information to ensure the public are aware of flood risks and flood warning arrangements.

The catchment has experienced a number of high flow events during the last 18 months that have resulted in out of banks flow and flooding to some degree. The ability of the Agency to give its stated target warning of at least 2 hours is difficult given the nature of the watercourses involved. 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 may only last 2-3 hours as the peak flow passes quickly through the system.




### **Effects**

Failure to provide timely warning reduces the degree to which people can take action to reduce the impact of flooding.



<b>Options</b>	<b>Responsibility</b>	<b>Comments</b>	<b>Theme</b>
<i>Review flood warning thresholds and procedures for the catchment.</i>	<i>Agency MAFF</i>	<i>Improved service of flood warnings.</i>	
<i>Complete previously planned improvements to river flow gauging and river level monitoring.</i>	<i>Agency MAFF</i>	<i>Improved data upon which to base flood warning decisions. More timely and accurate warnings to those at risk.</i>	
<i>Improve flow forecasting model for Lincoln.</i>	<i>Agency MAFF</i>	<i>Improved data upon which to base operation of Lincoln Flood Alleviation Scheme. More efficient use of flood water storage. Better security for Lincoln City.</i>	
<i>Review requirements for additional raingauge and river flow gauging.</i>	<i>Agency MAFF</i>	<i>Improved data gathering.</i>	
<i>Revise warning system for boats using the Fosdyke Canal and Witham.</i>	<i>British Waterways, Agency, Boat users / Liaison Groups</i>	<i>Improved service of flood warnings</i>	
<i>Extend flood warning dissemination service to all areas affected by flooding on main river.</i>	<i>Agency</i>	<i>Will provide flood warning to more residents.</i>	

A number of ongoing National strategic initiatives are relevant to this issue, these include.

Options	Responsibility	Comments	Theme
<i>To clarify and develop operational procedures and responsibilities with other organisations.</i>	<i>Agency, District Councils Police Emergency Services</i>	<i>Better management of flood events.</i>	
<i>To simplify and improve Agency flood warning procedures</i>	<i>Agency</i>	<i>Improved flood warning and prevention.</i>	
<i>Complete the production and dissemination of indicative flood risk maps</i>	<i>Agency</i>	<i>Improved understanding for ourselves and Planning Authorities of areas at risk of flooding</i>	

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

### Background








Localised flooding of riparian watercourses results as a consequence of insufficient maintenance, inappropriate culverting and the insufficient capacity of watercourses to accommodate increases in surface water run off which may follow development.

A typical example of this is at Minting where East Lindsey District Council are promoting a scheme to alleviate localised flooding which should be completed during 1999. Ultimately, the responsibility to deal with these problems lies with riparian owners. Local authorities have powers to resolve this problem but are increasingly reluctant to do so because of its resource implications and/or the lack of expertise.

A report by an independent review team to the Board of the Agency in September 1998, which was produced as a result of the Easter 1998 flood stated "The Agency should give greater attention to its general supervision and enforcement roles" in respect to 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."

### Effect

Localised flooding of some riparian watercourses occur following relatively minor rainfall events.

Options	Responsibility	Comments	Theme
<i>District Councils to use their powers to resolve problems.</i>	<i>Local Authorities</i>	<i>Management rests with responsible body. Lack of appropriate resource or expertise.</i>	
<i>Make riparian owners aware of their maintenance responsibilities.</i>	<i>Local Authorities/ Agency</i>	<i>Some riparian owners will take on board their responsibilities. Disjointed approach not always practicable.</i>	
<i>Agency to ensure new development incorporates appropriate provisions for land drainage.</i>	<i>Agency/ Developers</i>	<i>Future drainage problems are minimised. Does not address the ongoing maintenance needs or existing problems.</i>	
<i>Agency to liaise with Local Authorities to develop on agreed approach towards this problem.</i>	<i>Agency/ Local Planning Authorities/Internal Drainage Boards</i>	<i>Future drainage problems are minimised. None</i>	
<i>Exercise supervisory duty over flood defence matters and resolve non-main river drainage problems.</i>	<i>IDB Local Authority Riparian Agency Railtrack</i>	<i>Reduced risk of flooding.  Increased knowledge of all parties responsibilities.</i>	
<i>Watercourses (make watercourse main river).</i>	<i>Agency/MAFF</i>	<i>Management rests with responsible body Lengthy process not appropriate</i>	
<i>Extend Internal Drainage Board area.</i>	<i>Agency/ MAFF/IDBs</i>	<i>Management rests with responsible body. Lengthy process not appropriate in all cases.</i>	



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

## **Background**

The natural flow of rivers and watercourses following periods of heavy rainfall depends on a range of factors including the input of groundwaters, the rate at which surface water runs off the land and the gradient and form of the river channel itself. The most dramatic change to this natural rate is induced by changes in land use by man. This can be in the form of urbanisation which brings an increase in the impervious area of land and improved drainage systems. Together these increase the rate at which the rainwater reaches the receiving watercourse thus raising peak river levels. Changes in agricultural land use (e.g. the conversion of land from pasture to arable), can reduce the ability of land to buffer surface water run-off, with similar effects. The relative impact of such changes is a complex issue and difficult to assess.

The past 20 years have seen significant development within the catchment notably in urban areas such as Lincoln and Grantham. The implications of this development, in terms of impacts on river flows, is not fully understood.

The Agency's role in the planning process as a Statutory Consultee is to make both planning authorities and developers aware of flood risks in a specific area, the consequent constraints on development and any ways in which these may be overcome.

In practice we have followed a policy of seeking mitigation, against any increase in surface water run-off and lost flood storage capacity, by the provision of measures which would maintain the status quo.






There has been considerable speculation following the Easter '98 flood event (Northampton and elsewhere), with some blame for the flooding being attributed to past urban development. There is also concern regarding the potential impact of future development. The independent report into the Easter '98 flooding reflected this concern 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".

Wherever possible we wish to reduce flood risk to people and property and see a positive gain for the natural environment when development proposals are considered, leading to the restoration of floodplains and generally working with natural forces rather than against them.

## **Effects**

An increase in urbanisation leads to more impervious areas of land and an improved drainage system. This therefore increases the rate of rainwater reaching the watercourses and higher

peak river levels result. Changes in agricultural land use (such as the conversion of land from pasture to arable crops) can similarly reduce the ability of the land to buffer surface water run-off.

Options	Responsibility	Comments	Theme
<i>Undertake an assessment of the impact of development upon flood risk for Lincoln and Grantham</i>	<i>Agency</i>	<i>This would improve the Agency's understanding of existing flood risks and the impacts of development</i>	
<i>Agree a long-term development strategy with planning authorities.</i>	<i>Agency, Local Authorities</i>	<i>Necessary to reduce long term flood risks for people and property. Will address the need for sustainability to be taken into account in respect of development decisions.</i>	
<i>Complete delivery of final Section 105 flood risk maps to local authorities.</i>	<i>Agency</i>	<i>Will provide additional information upon which local authorities can base planning decisions.</i>	
<i>Carry out a review of relevant local and structure plans.</i>	<i>Agency, Local Authorities</i>	<i>Necessary to reduce long term flood risks for people and property. Will address the need for sustainability to be taken into account in respect of development decisions.</i>	
<i>Consider with local authorities policies which would result in future development contributing to a reduced flood risk.</i>	<i>Agency</i>	<i>Could reduce impacts of development on the environment and improve the efficacy of flood defences already provided. Increased effort will be required to gain the acceptance of this approach by developers.</i>	



**Waste compaction at a landfill site**



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;
- ☛ ensure achievement of national waste strategy targets for the reduction of waste disposed of to landfill;
- ☛ 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.**

### Background

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. Disposal options include retreading, burning to produce energy, crumbing to produce road and playing surfaces and landfill. Retreading is reportedly in decline and the number crumbed represents 10% of the total. Rising disposal costs has led to a reluctance of metal recyclers to accept tyres as part of the general scrap stream and a proposed EC Directive on landfill will ban the disposal of whole tyres to landfill by about the year 2003 and shredded tyres by the year 2006.

The result is an increase in fly tipping, for waste producers to stockpile their waste tyres, and for vast numbers to accumulate on illegal sites awaiting re-use or disposal. There is a very real potential for such stockpiles to catch fire.

Uncontrolled burning of tyres produces substances which can harm the environment ie. affect air and water quality and contaminate soil and vegetation. Black smoke and other substances such as volatile organic compounds, dioxins and polycyclic aromatic hydrocarbons are released into the atmosphere. Phenols, polycyclic aromatic hydrocarbons and metals

including zinc and iron can leach into groundwater and rivers. Water used to control the fire or rainfall causes these pollutants to be washed into the ground or runoff into nearby watercourses. Tyre dumps in themselves are an environmental eyesore and preclude beneficial land use.





We are extremely concerned that illegal tyre dumping may significantly increase. A recent report published by the Agency has looked into how this serious environmental threat should be tackled by addressing the usage of tyres and their impact on the environment. The Agency considers that more effort is needed to increase the lifetime of tyres, to reduce environmental impacts during their use, and to provide a range of sustainable ways of recovering them as a resource at the end of their lives. Further use in cement kilns, pyrolysis (the application of heat to chemical compounds in order to cause decomposition), use in highway construction, and landfill development, may offer potential options for disposal in the future.

In September 1997 the Agency became aware of a large tyre dump at Normanton Airfield. It is believed that the RAF started the dump over 30 years ago. Since they left, the site has taken tyres from a number of sources building up to a dump of more than 50,000 tyres.

We have held meetings with the landowner, the Roseland Group Limited. It was agreed that no more tyres would be accepted and that the dump would be dispersed over time. Some tyres have been removed to build a safety barrier around a skid patch and a contractor has removed some tyres for recycling. However this has made little impact on the overall number. Other opportunities are reviewed as they arise.

## Effects

The site is located on a minor aquifer and as with many airfields is likely to have extensive unmapped drainage leading to the Ease Drain, a tributary of the River Witham at Long Bennington. There is therefore acute potential risk to the environment in addition to the affects normally associated with such stockpiles.

Options	Responsibility	Comments	Theme
Remove the tyres immediately.	Landowner, Agency	Potential risks removed.	
Remove the tyres as options arise.	Landowner. Agency regulates.	Problem removed over time Tyres present in quantity continue to pose risk.	
<i>Develop a contingency plan for use in the event of an emergency on site.</i>	<i>Landowner Emergency Services, Agency Local Authority</i>	<i>Predetermined procedures for dealing with emergency situation, with reduced impact on environment Does not tackle main issue.</i>	 

## 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;
- 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.

#### Background

The Agency is responsible for regulating the treatment, keeping and disposing of wastes arising from industrial, household and commercial uses. By far the greatest portion of such waste (70% nationally) is sent to landfill. The biodegradation of organic matter produces landfill gas which consists of a mixture largely of methane (typically 64%) and carbon dioxide (34%). It also contains a wide variety of trace components including mercaptans which are extremely unpleasant to smell, and sometimes hydrogen sulphide which is extremely hazardous. In confined spaces the gas can give rise to asphyxiation hazards. Its migration off site through substrata can lead to the risk of explosion in nearby properties and crop damage. Release into the air can lead to smell nuisance and damage to the atmosphere.

The Agency document *The Environment of England and Wales – A snapshot* indicates that waste treatment and disposal contributes about one third to the total methane emissions to atmosphere from all UK sources. Methane is a greenhouse gas, trapping heat in the atmosphere. Its global warming potential is 24 times higher than that of carbon dioxide.







Electricity Companies are required by Order that they should make arrangements to secure the availability of a specified amount of capacity from non fossil fuel power stations. This is known as the Non Fossil Fuel Obligation. Utilisation of landfill gas by burning in generators qualifies for the scheme.

#### Effects

There are 6 active landfill sites in the catchment which take household, industrial and commercial waste (Colsterworth, Leadenham, Whisby, North Hykeham, Kirkby on Bain and Boston). These have provisions to vent landfill gas, reducing the potential for its migration.



The Agency encourages operators to collect and utilise methane for electricity generation. These sites now have schemes in the active, appraisal, or research stages. Should the schemes prove economically unviable or be longer term projects the Agency will consider requiring the provision of active collection and flaring under the terms of the Waste Management Licence.

Options	Responsibility	Comments	Theme
Passive venting	Operator	Reduces lateral migration. Emission direct to atmosphere of methane. Not always effective in preventing migration or odour.	
Active venting with flare.	Operator	Effective removal and destruction of landfill gas. High capital and running costs. No energy recovery	
<i>Active venting with utilisation.</i>	<i>Operator</i>	<i>Effective removal and destruction of landfill gas. Contributes to Non Fossil Fuel Organisation.</i>	 
<i>Encourage active extraction and use.</i>	<i>Agency</i>	<i>Negates need for formal action. Uncertain results.</i>	
Modify licences.	Agency	Ensures measures taken where appropriate. Unnecessary where measures taken.	

Other environmental concerns in the Witham Plan area relate to:-

## 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.

There are no issues raised specifically in respect of Regulating Major Industries. Related issues are addressed under other themes. The Witham Plan area is predominantly rural.

## 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, fulfilling the requirement under the Environment Act 1995 for national air quality. 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 on the proposals the Government intends to produce a revised version of the National Air Quality Strategy which will itself be subject to consultation during 1999, before it is finalised at the end of the year.

Locally there are very few processes which materially impact on air quality. The greatest stress on air quality is in the main from road traffic.



Lincoln City Centre



## **CHAPTER 4 – A BETTER ENVIRONMENT THROUGH PARTNERHIP**

### **Introduction**

The growing population and society's drive to create wealth and improve standards of living have increased the use of natural resources and waste production. Together these place the environment under increasing pressure.

In the Plan area, intensive farming practices, mineral extraction and urban development have impacted significantly on flora and fauna. Increasing demand for water to meet public water supply needs and for agricultural use add to these pressures.

Whilst the Agency has powers to deal with some aspects of environmental concern (See Appendix 1) these are not comprehensive and in many areas we must rely on working with others to protect the environment and minimise potential threats. These threats and major partnership initiatives are set out below:

**Urban development** can have a potentially adverse impact upon the environment. It can result in:

- (i) an increased risk/occurrence of flooding as a consequence of changes to surface water drainage
- (ii) an increased risk to surface and groundwater quality from both treated and untreated effluent discharges
- (iii) increased pressure upon the sewerage infrastructure
- (iv) an increased demand for water for industrial use and for public water supply
- (v) a loss of habitat due to "land take"
- (vii) increased levels of waste produced
- (vii) a risk to air quality
- (viii) a risk to flora and habitats as a consequence, directly or indirectly, of remedial flood defence works and/or water quality problems

The responsibility for regulating changes in land use lies with local planning authorities. Through the development plan process, which sets out the framework for land use change, and the implementation of development control, local councils decide on the location of new development, the redevelopment of existing areas and changes of use of land or buildings. We liaise closely with planning authorities in our role as a consultee, along with developers, and advise on proposals relevant to the Agency.

Local authorities also have a statutory responsibility to carry out periodic reviews of air quality in their areas. These reviews will form the basis for Local Air Quality Management Plans, assessing air quality problems and targeting areas for improvement. The Agency will liaise with local authorities in the Plan area on the development of air quality management plans.

The Agency is responsible for regulating the treatment, keeping and disposing of wastes arising from industrial, household and commercial uses. By far the greatest portion of such waste (70% nationally) is sent to landfill. However, regardless of how well landfill sites are located and engineered, they still have the potential to release pollutants into surface and groundwaters, soil and air. There are 6 active landfill sites and a large number of closed/historic landfill sites in the Witham Plan area, some of which have caused pollution problems in the past or have the potential to pollute. The Agency will work with local authorities and site operators to minimise the risk that landfill sites pose to the environment.

The following policy issues are particularly relevant to the Witham Plan area and we will encourage their inclusion in local authority development plans where appropriate:

**Policies which:**

- 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 the demand for water;
- 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 other environmental concerns;
- Seek to reduce the amount of waste created;
- Ensure that the disposal of waste does not have an adverse effect on any watercourse or groundwater;
- Resist development that would adversely impact upon air quality.

### **Agricultural land use**

Economic and commercial pressures on farmers to be more efficient, increase productivity and improve product quality have resulted in agricultural practices that may impact on the environment. These impacts can have both local and wider ranging implications:-

- (i) the use of fertilisers, pesticides and farm derived waste can impact on both surface and ground water quality. Pesticide contamination requires expensive remediation and fertilizers contribute to nutrient enrichment which impacts on the ecological balances of watercourses.

- (ii) soil quality can be affected by the use of pesticides which may indirectly kill soil organisms and compaction from farm machinery which can damage soil structure. Changing agricultural practices such as the removal of hedgerows have accelerated soil erosion and this can affect water quality in terms of increasing sediment loading, damage habitat by the deposition of silt on gravel beds and impact on drainage by blocking drainage pipes and culverts. Topsoil run-off can also carry other 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) abstraction of water for irrigation affects both water levels and quality.
- (v) ploughing land close to watercourses can cause large quantities of sediment to run-off following periods of heavy rain. The increased popularity of outdoor pig rearing exacerbates this problem.

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 initiatives such as the Code of Good Agricultural Practices for the Protection of Water, Soil and Air
- promote Stewardship schemes such as the creation of wet grassland to improve habitat diversity
- promote countryside access schemes
- encourage the construction of winter storage reservoirs as an alternative source of water for spray irrigation
- implement the new Groundwater Regulations to help prevent pollution of groundwater by controlling discharges or disposals of certain dangerous substances (eg. pesticides, sheep dip)

We will also

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



## **Industrial Activity**

Potentially polluting industrial emissions come in the form of:

- (i) discharges made after treatment directly to surface and tidal waters
- (ii) effluents discharged to foul sewers
- (iii) discharges to the atmosphere
- (iv) discharges such as waste to landfill sites and to land
- (vii) accidental spillages/discharges causing contamination of land and ultimately surface and groundwaters

Industrial abstraction of water from watercourses may also impact on downstream water levels and quality.

The responsibility for monitoring and authorising these discharges lies with both the Agency which issues permissions and consents where appropriate, with the sewerage undertaker and in the case of some industrial emissions to air, the Local Authorities.

As part of our regular contact with industry and commerce, we work with them to pre-empt and minimise risks involved, generally to our mutual benefit and using our enforcement powers where necessary. By adopting good waste reduction practices, industry and commerce have an opportunity to improve their business performance. Many individual companies have successfully introduced waste minimisation practices, and now remove hazardous material (eg mercury in domestic batteries) from the waste stream. In addition we are particularly proactive with respect to waste management practices involving ourselves and others in Local Agenda 21 initiatives.

The Agency is under a duty to prevent or minimise emission of all prescribed substances from industrial processes which are subject to regulation under the IPC system and to render harmless emissions from IPC processes. 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. They also have the potential to affect local air quality. A gas fired and potentially air cooled power station has recently been proposed at Sleaford. We will work with the local authorities and developers to ensure that any major proposals such as this do not pose a risk to air quality, water resources and the local environment.

The Agency will in partnership with industry:

- 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
- seek improvements in the quality of industrial emissions and reduce the risk of accidental discharges to the environment.

## **Local Agenda 21 and Educational Initiatives**

### **Local Agenda 21**

Agenda 21 is a 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 for everyone, recognising that environmental problems at all levels have their basis in local activities, it emphasises the need for local action in the message 'Think Globally, Act Locally'. Local authorities across the world were seen as the focus of promoting and encouraging local community action and were charged with producing a Local Agenda 21 (LA21).

The process in the UK has taken a variety of forms. Many Local Agenda 21 groups have been involved in the development of local state of the environment reports, (such as those for Lincolnshire) and sustainability indicators to help identify issues of local importance. These issues can then be developed into action plans and projects to deliver improvements.

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

In the Witham Area, we are involved in the forums set up by County, District and Unitary Authorities in response to the LA21 initiative. Examples of specific projects or groups we are involved in include 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. Damage is often caused, not through malicious intent to harm the environment but through carelessness and a lack of awareness. The Agency believes it should have an involvement in education at all levels. It is important to direct education to all aspects of our society not just education through schools and colleges.

Our education strategy 'Green Shoots', considers education into the next century, and 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

Environmental education is a central means of furthering our commitment to sustainable development. Education provides industry, commercial interests and the public with an awareness of, and hopefully an impetus to address environmental issues; this is vital to achieving a sustainable society. Education in its broadest sense means personal awareness, experience and interest developed over a period of time, whether at home, school, college or university, at work, or in the wider community. We hope to see environmental topics dovetail into the national curriculum and are committed to provide information to 'A' level and university students.

### **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. The UK response to this commitment was launched in January 1994 with "Biodiversity: The UK Action Plan" and guidance was given on the production of Local Biodiversity Action Plans. The purpose of Local Biodiversity Action Plans is to focus resources to conserve and enhance biodiversity by means of local partnerships, taking account of national and local priorities.

A Local Biodiversity Action Plan is both a product and process. It identifies where action needs to be taken to implement targets for habitats and species and it specifies appropriate mechanisms. Such plans also have a key role in monitoring progress of the conservation of biodiversity in the long term.

Local Biodiversity Action Plan "Frameworks" have been prepared by the Wildlife Trusts for Lincolnshire. 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, members of the public and 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



## **APPENDICES**

- 1. Duties Powers and Interests of the Agency**
- 2. The Routine Work of the Agency**
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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. For example we are not responsible for:-

- Domestic noise problems
- litter (unless it is restricting the flow of a river or is significant)
- Smell nuisance
- collecting waste in your local area
- planning permission
- environmental health
- food hygiene

These are all dealt with by your local planning authority who will liaise with 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:

Agency Duty	The Agency has powers to:	The Agency has an interest (but no powers) in:	Partnership
<p><b>Water Resources:</b></p> <p>The Agency has a duty to conserve, redistribute, augment and secure the proper use of water resources.</p>	<ul style="list-style-type: none"> <li>• Grant or vary water abstraction and impoundment licences on application.</li> <li>• 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.</li> <li>• 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.</li> <li>• Monitor and enforce abstraction and impoundment licence conditions.</li> </ul>	<ul style="list-style-type: none"> <li>• 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.</li> </ul>	<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>

Agency Duty	The Agency has powers to:	The Agency has an interest (but no powers) in:	Partnership
<p><b>Flood Defence</b></p> <p>The Agency has a duty to exercise general supervision over all matters relating to flood defence throughout each catchment.</p>	<ul style="list-style-type: none"> <li>•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).</li> <li>•Produce flood risk maps for all main rivers under S105 of Water Resources Act 1991.</li> <li>•Undertake works to main rivers using permissive powers.</li> <li>•Issue flood warning relating to main river to the public, local authorities and the police.</li> <li>•Consent mineral workings within 16 metres of main rivers.</li> </ul>	<ul style="list-style-type: none"> <li>•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.</li> <li>•Installation of surface water source control measures eg flood attenuation structures.</li> <li>•Supervising the maintenance of ordinary watercourses which is a Local Authority remit, but may impact on main rivers.</li> <li>•Installation of buffer zones which reduce flood risk and have significant environmental benefits.</li> <li>•Urban and rural land use and measures that can reduce flood risk or the need for watercourse maintenance.</li> </ul>	<p>As a statutory consultee on planning applications within main-river floodplains, the Agency offers advice based on knowledge of flood risk. It also advises on the environmental impacts or proposed floodplain development.</p> <p>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>
<p><b>Water Quality</b></p> <p>The Agency has a duty 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"> <li>•Issue discharge consents to control pollution loads in controlled waters.</li> <li>•Regulate discharges to controlled waters in respect of water quality through the issue and enforcement of discharges consents.</li> <li>• Issue notices to prevent pollution of controlled waters (Enforcement, Works and Groundwater Notices).</li> <li>•Prosecute polluters and recover the costs of clean-up operations.</li> </ul>	<ul style="list-style-type: none"> <li>•The control of runoff from roads and highways. This is a Highway Agency duty.</li> <li>•The greater use of source-control measures to reduce pollution by surface-water runoff.</li> <li>•Prevention and education campaigns to reduce pollution incidents.</li> </ul>	<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>



Agency Duty	The Agency has powers to:	The Agency has an interest (but no powers) in:	Partnership
<p><b>Air Quality</b></p> <p>The Agency has a duty to implement Part 1 of the Environment Protection Act 1990.</p>	<ul style="list-style-type: none"> <li>•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.</li> <li>•Have regard to the government's National Air Quality Strategy when setting standards for the releases to air from industrial processes.</li> </ul>	<ul style="list-style-type: none"> <li>•The vast number of smaller industrial processes which are controlled by Local Authorities.</li> <li>•Control over vehicular emissions and transport planning.</li> </ul>	<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>
<p><b>Radioactive Substances</b></p> <p>The Agency has a duty under the Radioactive Substances Act 1993 to regulate the use of radioactive materials and the disposal of radio-active waste.</p>	<ul style="list-style-type: none"> <li>•To issue certificates to users of radioactive materials and disposers of radio-active waste, with an overall objective of protecting members of the public.</li> </ul>	<ul style="list-style-type: none"> <li>•The health effects of radiation.</li> </ul>	<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>

Agency Duty	The Agency has powers to:	The Agency has an interest (but no powers) in:	Partnership
<p><b>Waste Management</b></p> <p>The Agency has a duty to regulate the management of waste, including the treatment, storage, transport and disposal of controlled waste, to prevent pollution of the environment, harm to public health or detriment to local amenities.</p>	<ul style="list-style-type: none"> <li>• Vary waste management licence conditions.</li> <li>• Suspended and revoke licences.</li> <li>• Investigate and prosecute illegal waste management operations</li> </ul>	<ul style="list-style-type: none"> <li>• 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.</li> </ul>	<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><b>Contaminated Land</b></p> <p>The Agency has a duty 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"> <li>• Regulate the remediation of contaminated land designated as special sites.</li> <li>• Prevent future land contamination by means of its IPC, Water Quality and other statutory powers.</li> <li>• Report on the state of contaminated land.</li> </ul>	<ul style="list-style-type: none"> <li>• Securing with others, including Local Authorities, landowners and developers, the safe remediation of contaminated land.</li> </ul>	<p>The Agency supports land remediation and will promote this with developers and Local Authorities and other stakeholders.</p>
<p><b>Conservation</b></p> <p>The Agency will 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>	<ul style="list-style-type: none"> <li>• 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.</li> </ul>	<ul style="list-style-type: none"> <li>• The conservation impacts of new development. These are controlled by Local Planning Authorities.</li> <li>• 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.</li> <li>• Implementation of the UK Biodiversity Plan for which it is the contact point for 12 species and one habitat.</li> </ul>	<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>

Agency Duty	The Agency has powers to:	The Agency has an interest (but no powers) in:	Partnership
<p><b>Landscape</b></p> <p>The Agency will 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>	<ul style="list-style-type: none"> <li>•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.</li> </ul>	<ul style="list-style-type: none"> <li>•The landscape impact of new development, particularly within river corridors. This is controlled by Local Planning Authorities.</li> </ul>	<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><b>Archaeology</b></p> <p>The Agency has a duty 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"> <li>•The Agency must promote its archaeological objectives through the exercise of its water-management and pollution-control powers and duties.</li> </ul>	<ul style="list-style-type: none"> <li>•Direct protection or management of sites or archaeological or heritage interest. This is carried out by LPAs, County Archaeologists and English Heritage.</li> </ul>	<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>
<p><b>Fisheries</b></p> <p>The Agency has a duty to maintain, improve and develop salmon, trout, freshwater and eel fisheries.</p>	<ul style="list-style-type: none"> <li>•Regulate fisheries by a system of licensing.</li> <li>•Make and enforce fisheries byelaws to prevent illegal fishing.</li> <li>•Promote the free passage of fish and consent fish passes.</li> <li>•Monitor fisheries and enforce measures to prevent fish-entrainment in abstractions.</li> <li>•Promote its fisheries duty by means of land-drainage consents, water abstraction applications and discharge applications.</li> </ul>	<ul style="list-style-type: none"> <li>•The determination of planning applications which could affect fisheries.</li> </ul>	<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>



Agency Duty	The Agency has powers to:	The Agency has an interest (but no powers) in:	Partnership
<p><b>Recreation</b></p> <p>The Agency has a duty to promote rivers and water space for recreational use.</p>	<ul style="list-style-type: none"> <li>• The Agency contributes towards its recreation duty through the exercise of its statutory powers and duties in water management.</li> </ul>	<ul style="list-style-type: none"> <li>• Promotion of water sports. This is carried out by the Sports Council and other sports bodies.</li> </ul>	
<p><b>Navigation</b></p> <p>The Agency has a duty to maintain (with others), the following Navigations in the Northern Area of Anglian Region:</p> <p>Ancholme, Witham, Welland, Nene</p>	<ul style="list-style-type: none"> <li>• Regulate navigation by a system of licensing.</li> <li>• Enforce navigation legislation.</li> </ul>	<ul style="list-style-type: none"> <li>• The management and operation of British Waterway's navigations and other navigations within the Region.</li> </ul>	<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, most of which is to achieve statutory requirements. The aim of regulation is to balance the needs of people and the environment. The Agency works 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
- make sure flood risks are not created or exacerbated.

Regulating the environment takes place through licensing. The Agency manages 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 Witham 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 and 49 registrations 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 in a tough way. Those who show little regard for the law and who cause blatant and persistent damage to the environment can expect to be prosecuted.

The Agency also has the role of reducing risk to people and the environment from flooding by providing effective defences. Protecting life is our highest priority and to meet this aim 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 regulate fisheries by issuing licences for rod angling and net fishing. We 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 both 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.

## Appendix 3

### River Ecosystem Classifications

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



## Appendix 4

### SETTING LONG-TERM OBJECTIVES

Anglian Region inherited two different systems for setting river quality objectives. One was based on the National Water Council (NWC) classification and the second a regionally-derived Use-related classes, which included salmonid and coarse fisheries and various types of amenity use. The majority of these objectives were consulted upon locally and set in the late 1970s/early 1980s.

To provide for a smooth transition to the new RE system the Agency has developed a protocol to merge both of these systems using a process of neutral translation. This relates the threshold standards for the relevant determinands in the new and old schemes.

The long-term quality objectives presented in this consultation report are largely derived from this neutral translation. However, for a limited number of stretches a review of historic data and an evaluation of both the chemical and biological characteristics of the river, indicates that the historic long-term objectives did not reflect the natural characteristics/land use in the vicinity of the river and/or these characteristics have changed over time.

#### Witham Area

#### Proposed WQOs - Classified stretches

SI = Spray Irrigation, LW = Livestock Watering, PWS(D) = Public Water Supply (Direct), IWS = Industrial Water Supply

\* Shaded entries indicate that short-term targets have been proposed

*Compliance has not been assessed for entries in italics as our review of stretches and sample points has resulted in the need for new sample points. Once data has been collected we will be able to assess whether there is a need for short-term targets and associated investigations.*

Watercourse	Stretch	Long-term RE target (Short-term RE target)*	Additional (locally derived) RQO's
WITHAM	HEADWATERS...COLSTERWORTH	RE2	LW
WITHAM	COLSTERWORTH...PAS	RE2	SI LW
WITHAM	PAS...CRINGLE BROOK	RE2 (RE3)	SI LW
CRINGLE BK	SKILLINGTON...WITHAM	RE2	PWS(D) SI LW
WITHAM	CRINGLE BROOK...MOW BECK	RE2	PWS(D) SI LW
WITHAM	MOW BECK...MARSTON STW	RE2	SI LW
WITHAM	MARSTON STW...FOSTON BECK	RE3	IWS SI LW
FOSTON BK	O/F DENTON RES...WITHAM	RE3	SI LW
WITHAM	FOSTON BECK...SHIRE DYKE	RE3	SI LW
WITHAM	SHIRE DYKE...BRANT	RE3	SI LW
BRANT	SAND BECK...WITHAM	RE3	SI LW
WITHAM	BRANT...NORTH HYKEHAM STW	RE3	SI LW
WITHAM	NORTH HYKEHAM STW...BRAYFORD	RE3	IWS SI LW
FOSSDYKE CANAL	R TRENT...TILL	RE3	IWS SI LW
TILL	SOMERBY BECK...KEXBY BECK	RE4	SI LW
TILL	KEXBY BECK...FOSSDYKE CANAL	RE3 (NONE pH ONLY)	SI LW
FOSSDYKE CANAL	TILL...BRAYFORD POOL	RE3 (RE4)	IWS SI LW
SKELLINGTHORPE MAIN DRAIN	R WITHAM... FOSSDYKE	RE*	-
OLD WITHAM	BRAYFORD...FISKERTON SLUICE	RE3	IWS SI LW
OLD WITHAM	FISKERTON SLUICE...BRANSTON LOCK	RE3	SI LW

BARLINGS EAU	FALDINGWORTH GRANGE...DUNHOLME BK	RE3	LW
BARLINGS EAU	DUNHOLME BECK...NETTLEHAM BECK	RE3	SI LW
NETTLEHAM BK	NETTLEHAM STW...BARLINGS EAU	RE3 (RE5)	SI LW
BARLINGS EAU	NETTLEHAM BECK...REEPHAM BECK	RE3 (RE4)	SI LW
BARLINGS EAU	REEPHAM BECK...WITHAM	RE3	SI LW
SINCIL DYKE	BARGATE WEIR...CANWICK STW	RE3 (RE4)	SI LW
SINCIL DYKE	CANWICK STW...SAND HILL BECK	RE3 (RE4)	SI LW
SINCIL DYKE	SAND HILL BECK...BRANSTON LOCK	RE3 (RE4)	SI LW
WITHAM	FISKERTON...BARDNEY	RE3	SI LW
ANWICK CATCHWATER	ANWICK STW...FARAWAY DRAIN	RE5	
FARAWAY DRAIN	ANWICK CATCHWATER...BILLINGHAY SKIRTH	RE3 (NONE pH ONLY)	SI LW
BILLINGHAY SKIRTH	FARAWAY DRAIN...WITHAM	RE3	SI LW
WITHAM	BARDNEY DOGDYKE	RE3 (RE4)	IWS SI LW
BAIN	A157 RD BR BURGH ON BAIN...GOULCEBY	RE2	SI LW
BAIN	GOULCEBY BECK...WARING	RE2	IWS SI LW
WARING R	BELCHFORD BAIN	RE1 (RE2)	SI LW
OLD BAIN	WARING...HORNCastle STW	RE2 (RE4)	IWS SI LW
OLD BAIN	HORNCastle STW...DALDERBY FORD	RE2 (RE4)	IWS SI LW
HORNCastle CANAL	R WARING...HALTHAM	RE2	IWS SI LW
HORNCastle CANAL/BAIN	HALTHAM BECK...CONINGSBY STW	RE2	IWS SI LW
BAIN	CONINGSBY STW...WITHAM	RE3 (RE4)	IWS SI LW



SLEA NEW	BOILING WELLS...RUSKINGTON BECK	RE2 (RE3)	SI LW
SLEA NEW	RUSKINGTON BECK...COBBLERS LOCK	RE2	SI LW
SLEA OLD	BATHS...SLEAFORD STW	RE4	SI LW
SLEA OLD	SLEAFORD STW...COBBLERS LOCK	RE4 (RE5)	SI LW
RUSKINGTON BK	RUSKINGTON STW...NEW SLEA	RE3	-
KYME EAU	COBBLERS LOCK...WITHAM	RE3 (RE4)	SI LW
WITHAM	DOGDYKE...GRAND SLUICE	RE3 (NONE pH ONLY)	SI LW
SOUTH FORTY FOOT DRAIN	CASSWELLS BRIDGE...HELPRINGHAM EAU	RE2 (RE3)	SI LW
SOUTH FORTY FOOT DRAIN	HELPRINGHAM EAU...BOSTON DOCK	RE3 (RE4)	LW
FRAMPTON TOWN DR	BRAMPTON...NEW HAMMOND BECK	RE4 (RE5)	
STONE BRIDGE DRAIN	SIBSEY N/LANDS...COWBRIDGE LOCK	RE3 (RE5)	SI LW
MAUD FOSTER DRN	COWBRIDGE LOCK...HAVEN	RE3 (RE4)	SI LW
HOBHOLE DRN	HEAD...LADE BANK BRIDGE	RE3	SI LW
HOBHOLE DRN	LADE BANK BRIDGE...WITHAM HAVEN	RE4 (RE5)	SI LW

### Proposed WQOs for the Witham - Non-classified stretches

Although these stretches are non-classified, and therefore will not have RE targets set on a statutory basis, for water quality management purposes the Agency wish to consult on proposals for RE targets.

SI = Spray Irrigation, LW = Livestock Watering

Watercourse	Stretch	Long-term RE target	Additional (locally derived) use-related RQOs
DENTON BECK	A607(DENTON)...GRANTHAM CANAL	RE3	SI LW
MOW BECK	HARLAXTON STW ...WALTHAM	RE4	-
GREAT GONERBY DYKE	GREAT GONERBY...RUNNING FURROWS	RE3	-
RUNNING FURROWS DYKE	RAILWAY...WITHAM	RE4	LW
LONDONTHORPE BECK	BELTON PARK...WITHAM	RE3	LW
HONINGTON BECK	SOURCE...WITHAM	RE3	SI LW
SHIRE DYKE	BENNINGTON FEN...WITHAM	RE3	SI LW
BRANT	GELSTON SPRING...SAND BECK	RE3	SI LW
FULBECK BECK	FULBECK STW...BRANT	RE5	LW
LEADENHAM BECK	LEADENHAM STW...BRANT	RE5	LW
NAVENBY BECK	NAVENBY...BRANT	RE5	-
BOULTHAM CATCHWATER	OLD WOOD...DECOY FARM	RE4	-
BOULTHAM CATCHWATER	DECOY FARM...WITHAM	RE3	-
WIGSLEY MAIN DRAIN	HARBY STW...FOSSDYKE CANAL	RE3	SI LW
TILL	CORRINGHAM...SOMERBY BECK	RE4	LW
SOMERBY BECK	GAINSBOROUGH STW ...TILL	RE3	LW

Watercourse	Stretch	Long-term RE target	Additional (locally derived) use-related RQOs
GLENTWORTH BECK	GLENTWORTH STW...TILL	RE4	LW
INGHAM BECK	INGHAM...TILL	RE5	LW
STURTON BECK	STURTON BY STOW STW...TILL	RE5	LW
CRICKET TILL	ALSTHORPE HILL...TILL	RE4	SI LW
NORTH DELPH	GREETWELL...WITHAM	RE3	SI LW
HACKTHORN BECK	HACKTHORN...BARLINGS EAU	RE3	-
FALDINGWORTH BECK	FALDINGWORTH...BARLINGS EAU	RE3	LW
DUNHOLME BECK	OLD MAN'S HEAD SPRING...BARLINGS EAU	RE3	SI LW
LEGSBY BECK	LEGSBY...BARLINGS EAU	RE3	LW
TORRINGTON BECK	HOLTON STW...BARLINGS EAU	RE3	SI LW
NETTLEHAM BECK	RISEHOLME LAKE...NETTLEHAM STW	RE3	SI LW
REEPHAM BECK	REEPHAM VILLAGE...BARLINGS EAU	RE4	SI LW
GOLTHO STW	WRAGBY STW...BARLINGS EAU	RE4	LW
STAINFIELD BECK	PANTON COVERT...BARLINGS EAU	RE3	SI
CARR DYKE	POTTERHANWORTH BOOTHS...NOCTON BECK	RE3	-
SANDHILL BECK	MERE HALL SPRING...SINCIL DYKE	RE2	SI LW
BRANSTON DELPH	BRANSTON BOOTHS...SINCIL DYKE	RE3	-
CARR DYKE...NOCTON DELPH	BRANSTON BK...DELPH DOORS WITHAM	RE3	SI LW
METHERINGHAM DELPH	HEAD OF CUT...WITHAM	RE3	LW
METHERINGHAM BECK	MANOR HOUSE SPRING...CARR DYKE	RE4	SI LW
CARR DYKE	MARTIN STW...TIMBERLAND DELPH	RE4	-
BUCKNALL	MINTING...WITHAM	RE3	SI LW



Watercourse	Stretch	Long-term RE target	Additional (locally derived) use-related RQOs
CATCHWATER/DUCKPOOL			
CARR DYKE/IMBERLAND DELPH	METHERINGHAM BK... WITHAM	RE3	SI LW
ROWSTON BECK	ROWSTON STW...SCOPWICK BR	RE5	-
SCOPWICK BECK	SCOPWICK...NEW CUT	RE3	-
NEW CUT	SCOPWICK BK...DORRINGTON DIKE	RE3	SI
NEW HILLS DRAIN	DORRINGTON...DORRINGTON DIKE	RE5	-
DORRINGTON DIKE	DORRINGTON CATCHWATER...BILLINGHAY	RE3	SI
BILLINGHAY SOKE DYKE	PRINCIPAL P/S...SKIRTH	RE5	-
REEDS BECK	WOODHALL SPA...DUCKPOOL WITHAM	RE3	-
SYKE DRAIN	WOODHALL STW...ENGINE DRAIN	RE4	-
ENGINE DRAIN	STIXWOULD...P/S WITHAM	RE4	-
BAIN	LUDFORD...A157 RD BR BURGH ON BAIN	RE2	SI LW
GOULCEBY BECK	SCAMBLESBY...BAIN	RE2	SI
HALTHAM BECK	REVESBY RES...BAIN	RE3	SI LW
GRANTHAM CANAL	WOOLSTHORPE...GRANTHAM	RE3	SI LW
ANCASTER BECK/SLEA	WILLOUGHBY SPR...BOILING WELLS	RE4	SI LW
LEASINGHAM BECK	LEASINGHAM VILLAGE...O/F RUSKINGTON BK	RE4	SI LW
CRANWELL BECK	CRANWELL STW...RUSKINGTON BECK	RE5	-
RUSKINGTON BECK	U/S RUSKINGTON	RE3	-
SOUTH FORTY FOOT DRAIN	GUTHRAM GOWT...CASSWELLS BR	RE3	SI LW
THE OLD BECK	KIRKBY UNDERWOOD...CARR DYKE	RE3	SI LW
CARR DYKE	DYKE...OLD BECK	RE4	SI LW

Watercourse	Stretch	Long-term RE target	Additional (locally derived) use-related RQOs
RIPPINGDALE RUNNING DYKE	OLD BECK/CAR DYKE...SOUTH FORTY FOOT DRAIN	RE3	SI LW
POINTON LODE	LITTLE DOWSBY...SOUTH FORTY FOOT DRAIN	RE3	SI
BILLINGBOROUGH LODE	MARSEDYKE...SOUTH FORTY FOOT DRN	RE3	SI
OUSEMERE LODE	BILLINGBOROUGH...SOUTH FORTY FOOT DRAIN	RE3	SI LW
SWANTON EAU	THE GROVE...SOUTH FORTY FOOT DRAIN	RE4	SI
CLIFF BECK/MOOR DRAIN	HEADWATERS...NORTH BK	RE4	SI LW
SOUTH BECK	OSBOURNBY...NORTH BK	RE4	SI LW
NORTH BECK	CULVERTHORPE LAKE...HELPRINGHAM	RE3	SI LW
HELPRINGHAM EAU	CLIFF/NORTH BK...SOUTH FORTY FOOT DRAIN	RE3	LW
HECKINGTON HEAD DYKE	WASH DYKE BR...SKERTH DRN	RE3	SI LW
HOLLAND DYKE	HEAD OF CUT...SKERTH DRAIN	RE3	LW
SKERTH DRAIN	HEAD DYKE/HOLLAND DYKE...SOUTH FORTY FOOT	RE4	LW
CLAY/GILL DYKE	SOUTH FORTY FOOT DRAIN...NORTH FORTY FOOT DRAIN	RE3	-
NORTH FORTY FOOT DRAIN	CHAPEL HILL...SOUTH FORTY FOOT DRAIN	RE3	-
MILL DRAIN	DONNINGTON...HAMMOND BECK	RE5	-
NEW HAMMOND BECK	SURFLEET...SOUTH FORTY FOOT DRAIN	RE3	SI LW
WEST FEN CATCHWATER	HEAD OF CUT...EAST FEN CATCHWATER	RE3	SI LW
EAST FEN CATCHWATER	HEAD OF CUT...WEST FEN CATCHWATER	RE3	SI LW
BELLWATER DRAIN	HEAD OF CUT...HOBHOLE DRAIN	RE3	SI LW
EAST FODDER DYKE	MARFLEET BR...HOBHOLE DRAIN	RE3	SI LW

Watercourse	Stretch	Long-term RE target	Additional (locally derived) use-related RQOs
MALLOWS DRAIN	SIBSEY STW...HOBHOLE DRAIN	RE5	-
CASTLE DIKE	BETINSON BR...NEWHAM DRN	RE3	SI LW
NEWHAM DRAIN	MAREHAM GATE...COWBRIDGE	RE3	SI LW
MEDLAM DRAIN	REVESBY BR...FRITHVILLE	RE3	SI LW
WEST FEN DRAIN	COWBRIDGE LOCK...FRITHVILLE	RE3	LW
KELSEY/COWBRIDGE DRAIN	WEST FEN DRAIN...HOBHOLE DRAIN	RES	SI LW



## Appendix 5

### DANGEROUS SUBSTANCES WITH STATUTORY STANDARDS

List I substances are regarded as particularly dangerous because of their toxicity, persistence and bioaccumulation. Pollution of the water environment by List I substances are to be eliminated. The EU lays down standards for these substances. List II substances are less dangerous, but may still have a deleterious effect on the aquatic environment. Pollution by List II substances must be reduced. The EU Member States set standards for these in national law.

Red List substances, like those in Lists I and II are dangerous because of their toxicity, persistence and bioaccumulation. The government agreed to reduce the input loads of Dangerous Substances to the North Sea by 50% by 1995 (using 1988 as a baseline).

## Dangerous Substances List

	LIST I	LIST II	RED LIST
<b>METALS</b>			
Mercury (Hg)	****		****(1)
Cadmium (Cd)	****		****(1)
Copper (Cu)		****	
Zinc (Zn)		****	
Lead (Pb)		****	
Tributyltin (TBT)			****
Triphenyltin (TPT)			****
Organotins		****	
Chromium (Cr)		****	
Nickel (Ni)		****	
Arsenic (As)		****	
Boron (B)		****	****
Vanadium (V)		****	
PCBs			****
<b>PESTICIDES &amp; ORGANOCHLORINES</b>			
Hexachlorocyclohexane	****		
Gamma-HCH (Lindane)			****
DDT	****		****
Aldrin	****		****
Dieldrin	****		****
Endrin	****		****
Isodrin	****		
Trifluralin			****
Trichlorobenzene	****		****
Trichloroethylene	****		
Tetrachloroethylene	****		
Hexachlorobenzene	****		****
Hexachlorobutadiene	****		****
Carbon Tetrachloride	****		
Chloroform	****		
Endosulfan			****
Dichlorvos			****
Fenitrothion			****
Malathion			****
Azinphos-methyl			****
Atrazine			****
Simazine	****		****
Pentachlorophenol	****		****
1,2 Dichloroethane			****
Mothproofing Agents		****	
pH		****	

## Appendix 6      Glossary and Abbreviations

<b>Abstraction</b>	The removal of water from any source, either permanently or temporarily, usually by pumping.
<b>Abstraction Licence</b>	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 etc.
<b>Agrochemicals</b>	Chemical substances used in agricultural production including fertilisers, herbicides, fungicides and insecticides.
<b>Algae</b>	Microscopic (sometimes larger) plants, which may be floating or attached. Algae occur in still and flowing water.
<b>Alleviation of Low Flows (ALF)</b>	The strategy for resolving environmental problems caused by over-abstraction in certain catchments.
<b>Ammonia</b>	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.
<b>AMP (Asset Management Plans)</b>	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 are drawn up through consultation with the Environment Agency and other bodies to cover a five year period. AMPs have to be agreed by DETR and OFWAT.
<b>Aquifer</b>	A permeable geological stratum or formation that is capable of both storing and transmitting water in significant amounts.
<b>Base Flow</b>	That part of the flow in a watercourse made up of groundwater and discharges. It sustains the watercourse in dry weather.
<b>Biochemical Oxygen Demand (BOD)</b>	A standard test which measures over 5 days the amount of oxygen taken up by aerobic bacteria to oxidise organic (and some inorganic) matter.
<b>Biodegradable</b>	Capable of being decomposed by bacteria or other biological means.
<b>Biodiversity</b>	Diversity of biological life, the number of species present.
<b>Biomass</b>	Total quantity or weight of organisms in a given area or volume - e.g. fish biomass is measured as grammes per square metre ( $\text{gm}^2$ ).
<b>Brundtland Report</b>	Report of the 1987 World Commission on Environment and Development.
<b>Buffer Zone (strip)</b>	Strip of land 10-100m wide, alongside rivers which is removed from intensive agricultural use and managed to provide appropriate habitat types.
<b>Catchment</b>	The total area from which a single river system collects surface run-off.
<b>Catchment Management Plan (CMP)</b>	An integrated plan for a river catchment produced by the National Rivers Authority (NRA).
<b>Coarse Fish</b>	Freshwater fish other than salmon and trout.
<b>Consent (Discharge)</b>	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.



<b>Controlled Landfill</b>	Where wastes are deposited in an orderly planned manner at a site licensed under the Control of Pollution Act 1974.
<b>Controlled Waste</b>	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.
<b>Controlled Waters</b>	All rivers, canals, lakes, groundwaters, estuaries and coastal waters to three nautical miles from the shore, including the bed and channel which may for the time being be dry.
<b>Countryside Stewardship Scheme</b>	Scheme set up by the Countryside Commission in which landowners are grant aided to manage their land in an environmentally sensitive manner.
<b>Dangerous Substances</b>	Substances defined by the European Commission as in need of special control. This is because they are toxic, accumulate and concentrate in plants and animals, or do not easily break down into less dangerous substances. They are classified as List I or List II.
<b>Demand Management</b>	Activities to manage the amount of water required from a source of supply; includes measures to control waste and/or to discourage use.
<b>Development Plans</b>	(Local Plans, Structure Plans) - Planning documentation which makes provision for the control of the use of land through structure plans, local plans and the grant or refusal of planning permission.
<b>Diffuse Pollution</b>	Pollution from widespread activities with no one discrete source eg acid rain, pesticides, urban run-off etc.
<b>Dissolved Oxygen (DO)</b>	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.
<b>District Local Plans</b>	Statutory documents produced by District or Borough Councils to implement the development strategy set out in County Structure Plans. Specific land use allocations are identified.
<b>EC Regulation</b>	European Community legislation having legal force in all member states.
<b>EU Directive</b>	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.
<b>Ecosystem</b>	A functioning, interacting system composed of one or more living organisms and their effective environment, in biological, chemical and physical sense.
<b>Effluent</b>	Liquid waste from Industry, agriculture or sewage treatment plants.
<b>Emission</b>	A material which is expelled or released to the environment. Usually applied to gaseous or odorous discharges to atmosphere.
<b>Environmental Assessment</b>	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.
<b>Environmental Quality Standard (EQS)</b>	The concentration of a substance which must not be exceeded if a specific use of the aquatic environment is to be maintained.
<b>Eutrophic</b>	A description of water which is rich in nutrients. At worst, such waters are sometimes beset with unsightly growths of algae.
<b>Eutrophication</b>	The enrichment of water by nutrients, especially nitrogen and/or phosphorous, which cause accelerated growth of algae and high plant life, changes in the ecological balance and deterioration in water quality.

<b>Fauna</b>	Animal life.
<b>Fish Biomass</b>	A measure of the quality of a fishery as found in terms of surveys, weight by area ie g/m <sup>2</sup> .
<b>Fish Pass</b>	A device to permit fish to transverse structures within a river.
<b>Flood Defences</b>	Anything natural or artificial that protects against flooding, to a designed return period.
<b>Flood Defence Standard</b>	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.
<b>Flood Storage Reservoir</b>	An area of land whose prime purpose is to receive and store flood flows usually to prevent flooding of adjacent or valuable land.
<b>Flood Plain</b>	This includes all land adjacent to a watercourse over which water flows or would flow but for flood defences in times of flood.
<b>Flora</b>	Plant life.
<b>Fluvial</b>	Relating to the freshwater river.
<b>Fly Tipping</b>	The illegal dumping of rubbish/material in places such as hedgerows, lay-bys, fields even on streets and in parks.
<b>Gas Migration</b>	The movement of gas from the wastes within a landfill site to adjoining strata, or emission into the atmosphere.
<b>Gauging Station</b>	A site where the flow of a river is measured.
<b>General Quality Assessment (GQA)</b>	A new scheme replacing the NWC Classification system. It provides a means of assessing and reporting environmental water quality in a nationally consistent and objective way. The chemical grades for rivers introduced in 1994 uses BOD, Ammonia and Dissolved Oxygen limits for water quality 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 under trial now.
<b>Geomorphology</b>	Scientific study of land forms and of the processes that formed them.
<b>Global Warming</b>	The increase in the average temperature of the earth, thought to be caused by the build up of greenhouse gases.
<b>Groundwater</b>	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).
<b>Groundwater Protection Policy</b>	Environment Agency policy which controls activities having the potential to pollute groundwater resources.
<b>Habitat</b>	The customary and characteristic dwelling place of a species or community.
<b>Hydrogeology</b>	The study of the occurrence and movement of groundwater and the interaction with geology.
<b>Hydrometric</b>	The measurement of water.
<b>Impermeable</b>	Used to describe materials, natural or synthetic, which have the ability to resist the passage of fluid through them. It is usually expressed as the coefficient of permeability. This property is not absolute, and a cut-off coefficient of permeability of 10 <sup>-9</sup> m/sec for water is often used to describe a landfill liner material as impervious. The coefficients of

permeability of materials for gases are likely to be greater.

<b>Impounded</b>	The holding back of water behind a dam. Strictly a structure which raises water levels above their "normal" height. May need a licence and/or Land Drainage Consent from the Environment Agency.
<b>Inert Waste</b>	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.
<b>In river needs</b>	The requirement for an acceptable regime of river flows necessary to sustain legitimate 'in-river' uses, including biological requirements as well as human uses - such as navigation, power generation and amenity.
<b>Insecticide</b>	Substances used to destroy or repel insects.
<b>Internal Drainage Boards (IDBs)</b>	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.
<b>Integrated Pollution Control</b>	A system of pollution control, administered by Her Majesty's Inspectorate of Pollution, 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.
<b>IPC Authorisation</b>	An authorisation issued by Her Majesty's Inspectorate of Pollution prescribed by the Environmental Protection Act 1990 covering certain operation of processes.
<b>Landfill</b>	The engineered deposit of waste into or onto land in such a way that pollution or harm to the environment is minimized or prevented and, through restoration, to provide land which may be used for another purpose.
<b>Landfill Gas</b>	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 vapours and gases.
<b>Leachate</b>	Liquor formed by the act of leaching.
<b>Licence of Right</b>	Licence granted under Section 23 of the Water Resources Act 1963 in respect of an abstraction which was already in operation when that Act was passed.
<b>Local Agenda 21</b>	At the Earth Summit in Rio de Janeiro in June 1992, world leaders signed a global environment and development action plan called Agenda 21. The majority of Agenda 21 cannot be delivered without the commitment and cooperation of local government. Each local authority is encouraged to adopt its individual Local Agenda 21 - its own sustainable development strategy at the local level, involving partnerships with other sectors, such as the Environment Agency, businesses, community and voluntary groups.
<b>Local Environment Agency Plan</b>	Environment Agency's integrated local management plan, for identifying and assessing, prioritising and solving local environmental issues related to the Agency's functions, taking into account the views of the Agency's local customers. The outcome of the process is a local programme of integrated action for environmental improvement in order to optimise benefit for the local environment.
<b>Main River</b>	The watercourse shown on the statutory 'Main River maps' held by Environment Agency and MAFF. The Agency has permissive powers to carry out works of maintenance and improvement on these rivers.
<b>Methane</b>	A colourless, odourless, flammable gas, formed during the anaerobic decomposition of putrescible matter. It forms an explosive mixture in the range 5-15% methane in air.

<b>Minimum Residual Flow (MRF)</b>	Target flow set locally and not legally defined.
<b>Mitigation</b>	Refers to the environmental impact of scheme development or operation and the actions which may be taken to reduce or ameliorate such impacts.
<b>Nitrate Sensitive Areas (NSA)</b>	An area where nitrate concentrations in sources of public drinking water exceed, or are at risk of exceeding the limit of 50 mg/l laid down in the 1980 EC Drinking Water Directive, and where voluntary, compensated agricultural measures were introduced in 1990 as a means of reducing those levels.
<b>Nitrate Vulnerable Zone (NVZ)</b>	An area where nitrate concentrations in sources of public drinking water exceed, or are at risk of exceeding the limit of 50 mg/l laid down in the 1991 EC Nitrate Directive, and where compulsory, un-compensated agricultural measures have been introduced from 1996 as a means of reducing those levels.
<b>Non Fossil Fuel Obligation (NFFO)</b>	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.
<b>Nutrient</b>	Substance providing nourishment for plants and animals eg nitrogen, phosphorus.
<b>Outfall</b>	The point at which a river discharges to a downstream source eg estuary, sea; it may also include an outfall structure to prevent sea waters backing up the system.
<b>Particulates</b>	Fine solid particles found in the air or in emissions.
<b>Pesticides</b>	Substances used to kill pests, weeds, insects, fungi, rodents etc.
<b>Public Water Supply</b>	The supply of water by companies appointed as Water Undertakers by the Secretary of State for the Environment under the Water Industry Act 1991.
<b>Putrescible Waste</b>	Solid waste which will produce leachate when chemically and or biologically degraded.
<b>Ramsar</b>	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).
<b>Return Period</b>	Refers to the frequency of a rainfall or flooding event. Flood events are described in terms of the frequency at which, on average, a certain severity of flow is exceeded. This frequency is usually expressed as a return period in years, eg. 1 in 50 years.
<b>Riparian</b>	Of, or on, land contiguous to the river.
<b>Riparian Owner</b>	Owner of riverbank and/or land adjacent to a river. Normally owns riverbed and rights to midline of channel.
<b>River Corridor</b>	The continuous area of river, river banks and immediately adjacent land alongside a river and its tributaries.
<b>River Quality Objectives (RQO)</b>	The level of water quality that a river should achieve, in order to be suitable for its agreed use. Is being replaced by Water Quality Objectives (WQO's).
<b>Saline Intrusion</b>	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.



<b>Sewerage</b>	System of sewers usually used to transport sewage to a sewage treatment works.
<b>Siltation</b>	At low velocities water will deposit the material being carried in suspension. The slower the velocity the finer the material deposited. A deposit of clays and silt is very difficult to remove naturally as it requires turbulent and high velocities.
<b>Site of Special Scientific Interest (SSSI)</b>	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.
<b>Source Protection Zones</b>	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.
<b>Special Protection Area (SPA)</b>	Statutory protected habitats for wild birds under EC Regulations.
<b>Spray Irrigation</b>	The watering of crops by spraying. Can have a high impact on water resources.
<b>Statutory Water Quality Objectives (SWQO)</b>	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.
<b>Surface Water</b>	Water collecting on and running off the surface of the ground.
<b>Sustainable Development</b>	Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.
<b>Telemetry</b>	A means of directly collecting data from remote sites.
<b>Urban run-off</b>	Rainfall from towns and cities that is carried off by streams and rivers.
<b>Washlands</b>	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.
<b>Waste Minimisation</b>	Reducing the quantity and/or hazard of waste produced.
<b>Water Quality Objectives (WQO)</b>	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.
<b>Water Resource</b>	The naturally replenished flow of recharge of water in rivers or aquifers.
<b>Water Table</b>	Top surface of the saturated zone within the aquifer.
<b>Wetland</b>	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.
<b>Winter Storage Reservoir</b>	Reservoirs built by farmers to store water during the winter months when it is "plentiful" for re-use during the summer.

## ABBREVIATIONS

AMP	Asset Management Plan
AWS	Anglian Water Services Ltd
BAP	Biodiversity Action Plan
BW	British Waterways
DETR	Department of the Environment Transport and the Regions
FRCA	Farming and Rural Conservation Agency
FWAG	Farming and Wildlife Advisory Group
IDB	Internal Drainage Board
LTNC	Lincolnshire Trust for Nature Conservation
MAFF	Ministry of Agriculture Fisheries and Foods
MRF	Minimum Residual Flow
NSA	Nitrate Sensitive Area
NVZ	Nitrate Vulnerable Zone
RE	River Ecosystem
RQO	River Quality Objective
TWA	Trent Witham Ancholme Transfer Scheme
SAC	Special Area of Conservation
SA(E)	Sensitive Area Eutrophic
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
STW	Sewage Treatment Works
SWQO	Statutory Water Quality Objective
UWWTD	Urban Waste Water Treatment Directive
WLMP	Water Level Management Plan
WQO	Water Quality Objective

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The Environment Agency delivers a service to its customers, with the emphasis on authority and accountability at the most local level possible. It aims to be cost-effective and efficient and to offer the best service and value for money.

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**0645 333 111**

The 24-hour emergency hotline number for reporting all environmental incidents relating to air, land and water.

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