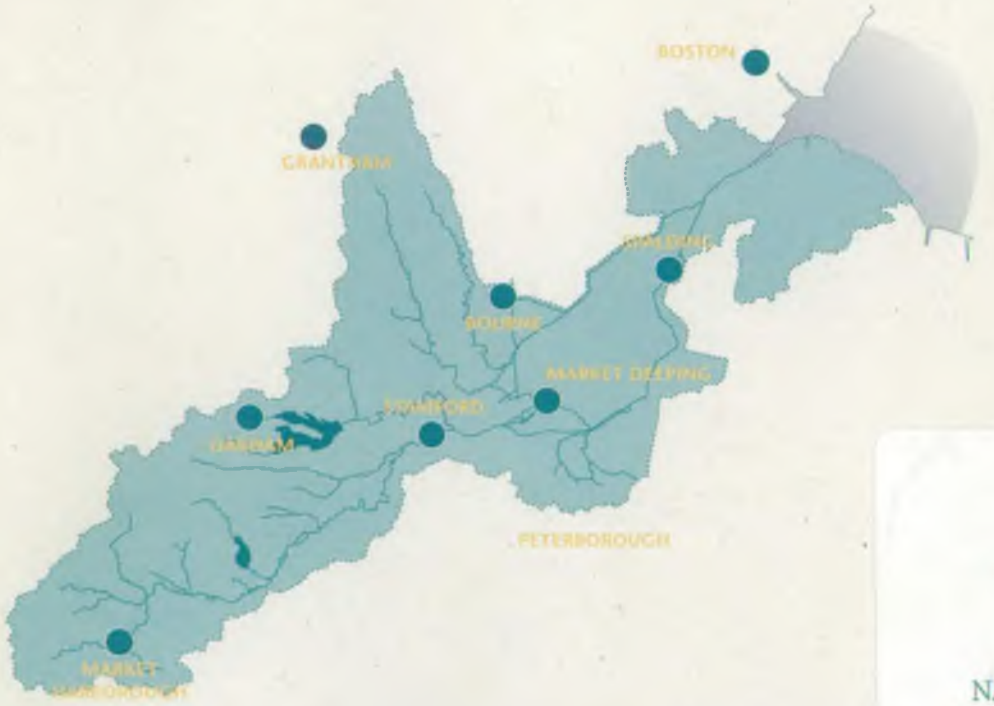
local environment agency plan

WELLAND

CONSULTATION REPORT

JUNE 1997



ENVIRONMENT AGENCY

vision

The Welland Plan area is home and workplace to approximately 125,000 people. It is a principally rural area of contrasting landscapes and a long history of cultivation. To the west of the Plan are the headwaters of the River Welland and its tributaries lie within the rolling hills of the upper catchment, which then fall away as the Welland flows into the Fens and ultimately to the Wash. The rural communities are mostly based around the market towns of the area, such as Market Harborough, Oakham, Stamford and Spalding.

The characteristics and appearance of the Plan area have significantly altered over recent centuries, through the creation of productive agricultural land and the development of albeit limited urban centres with their associated industry. This is nowhere more apparent than in the east of the Plan area where the Fens have been successively drained to form some of the most productive agricultural land in the country. Another important manmade feature in the Plan area, and one that is a significant resource within the area in many ways, is that of the reservoir of Rutland Water. Built primarily to provide drinking water to the East Midlands, it also is a wildlife conservation area of national importance, and provides an important water based leisure amenity to the whole area.

The pressures from development and changing land use, in turn have led to increased demands for water and changes in the nature of land drainage, which can not only increase the risk of flooding, but also alter the quality of water and impact on wildlife conservation. Further pressures are exerted by the increasing production of waste which must be disposed of safely and sustainably whether to land, air or water. Our challenge is to balance the needs and expectations of those living and working in the Plan area with the need to protect the environment. These challenges will be addressed by implementing solutions to existing problems and by encouraging sustainable solutions to economic and community development.

This balance will be achieved through the protection of the quantity and quality of surface and ground waters, sustainable policies for waste disposal, air quality management plans, the provision of effective flood defences and by actively seeking opportunities for improving wildlife conservation and recreation.

Within the next 10-15 years we aim to achieve, in partnerships with others, the following actions that are particularly relevant to the Welland Plan area:

- **Make progress toward sustainable management of water resources, particularly in the lower Welland reaches and the Glen catchment, which balances the competing demands of mankind and the water environment;**
- **To maintain and improve water quality, particularly where water quality targets are not met;**
- **Develop a long term solution to groundwater pollution at Helpston, which protects water resource for the future and the water environment;**
- **Educate the public in the awareness of sustainable use of resources, both in terms of waste minimisation and water conservation;**
- **To maintain the generally high standard of flood defences and where necessary improve levels of protection;**
- **Using initiatives such as the Biodiversity Action Plans, realise opportunities to improve the wildlife conservation value of the Plan area;**
- **Liaise with local authorities over the production of local air quality management plans.**

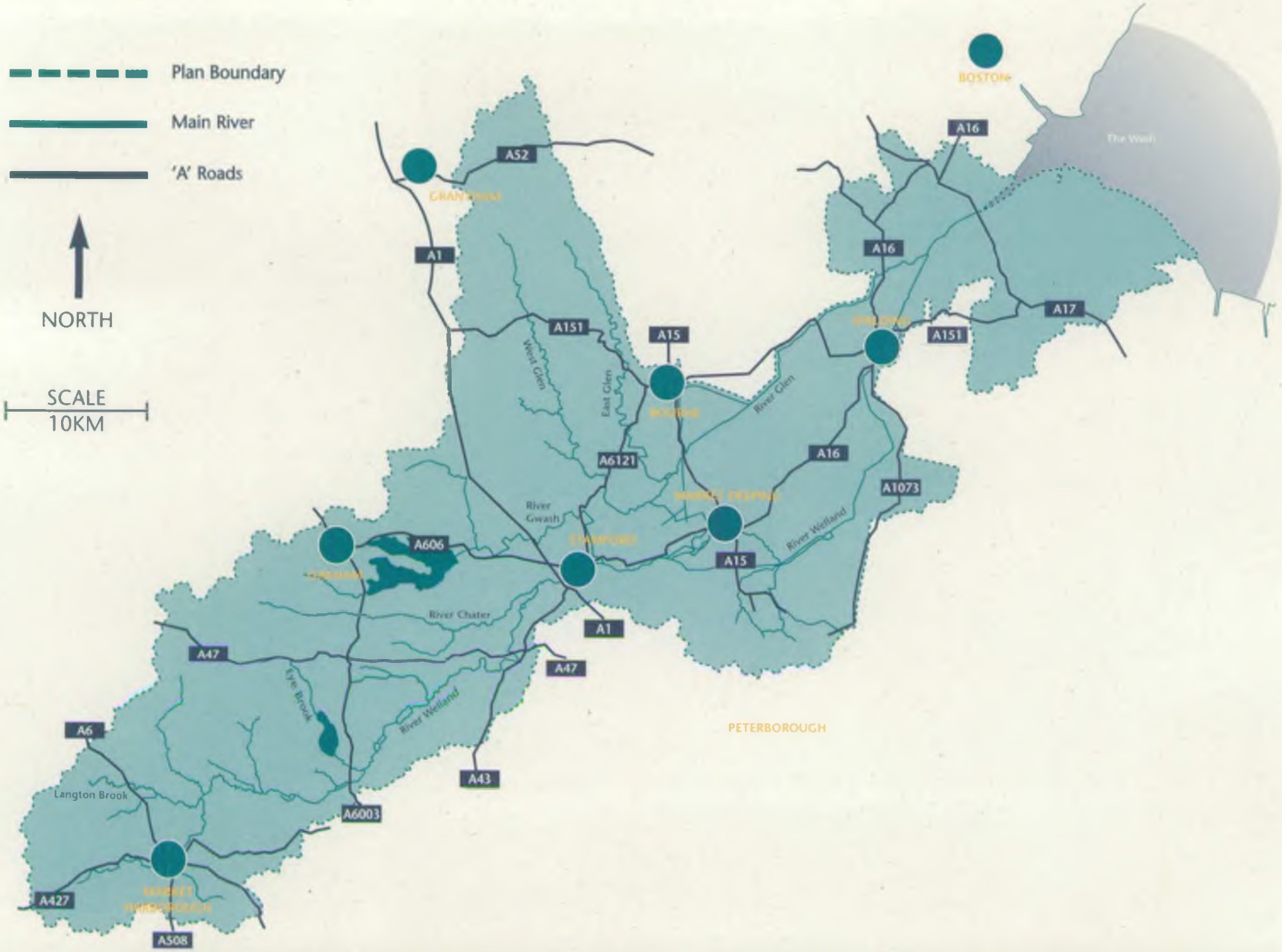
The successful future management of the Plan area requires us to respond effectively to ever increasing pressures exerted on the environment and thereby ensure its protection: We will reconcile the conflicting demands on the environment of the Welland Plan area and target resources where most needed.

It is through establishing strong links with local communities, working together with industry and agriculture, and increasing public awareness of the need to protect our environment, that this vision will become reality.

consequences for the intensive agricultural activities presently sustained within the Washes.

- gravity outfalls from Internal Drainage Board carriers and the River Glen can be restricted as a result, with similar consequences;

Options	Responsibilities	Advantages	Disadvantages
Implement recommendations of the River Outfalls Study: - *maintenance of training walls;* - *periodic raising of training walls, to keep pace of the accretion of the adjacent foreshore;* - *dredging of navigation channels by port operators;* - *clearance of silt at tidal sluices and outfalls;* - *removal of warp from channel banks*	*Environment Agency, Port Authority, Local authorities, MAFF*	*Integrated management of defence.*	*Cost.* *Potential impact on the local conservation area of the Wash.*
Consider siltation effects in determining minimum residual flow to tide.	Environment Agency	Reduced siltation downstream of tidal doors. Balances competing physical and ecological demands for water.	
Do nothing			Continued siltation. Impeding gravity outfalls leading to an increased need to pump. Further navigation restrictions. Potential need for Washlands.


Plan Boundary
Main River
'A' Roads
NORTH
SCALE
10KM
BOSTON
The Wash
GRANTHAM
A52
A1
A16
A16
A17
A151
A151
A15
A15
West Glen
East Glen
River Glen
A6121
A16
A1073
River Gwash
River Welland
A606
River Chater
A1
A47
A47
Eye Brook
River Welland
PETERBOROUGH
A6
Langton Brook
A43
A6003
A427
A508

your views

This document forms the basis for consultation between the Environment Agency and all those with interests in the Plan area.

The Environment Agency would welcome your views on the future management of this area:

- **Have all the important environmental issues been identified?**
- **Have all the options and solutions to issues been identified?**
- **Which issues and options do you support or oppose?**
- **Do you have any other information or ideas you would like to express?**

All comments received will be treated as public information unless you explicitly state otherwise in your response.

Following the consultation period all comments received will be considered in preparing the next phase, the Action Plan. The consultation report will not be rewritten as part of the Action Plan process.

We intend that the Plan should influence the policies and action of developers, planning authorities and other organisations as well as assisting in the day to day management of the Plan area.

Correspondence on the Consultation Report should be sent to:

The Catchment Planning Officer
Environment Agency
Waterside House
Waterside North
Lincoln
LN2 5HA

All contributions should be made in writing by 12 September 1997

INTRODUCTION

Local Environment Agency Plans are being developed by the Agency for the whole of England and Wales. Their primary purpose is to enable us to identify and focus upon the problems and issues for those areas of the environment over which we have an influence, and to develop a plan of actions to remedy those problems. This Consultation Document marks the first step in the process by discussing the issues we have identified in our consideration of the Welland Plan area and a range of options to resolve them.

Through the process of developing these Plans and through this consultation mechanism, as an organisation, we benefit from our interaction with partner organisations and the public. By addressing the issues from a wider perspective we hope to cultivate integrated solutions thereby improving our management of them.

This consultation process gives you an opportunity to influence our decision making and actions. We ask therefore that you read this document and let us know what you feel about the issues raised, have you any alternative solutions you feel we should consider and are there issues in the area which we have not addressed?

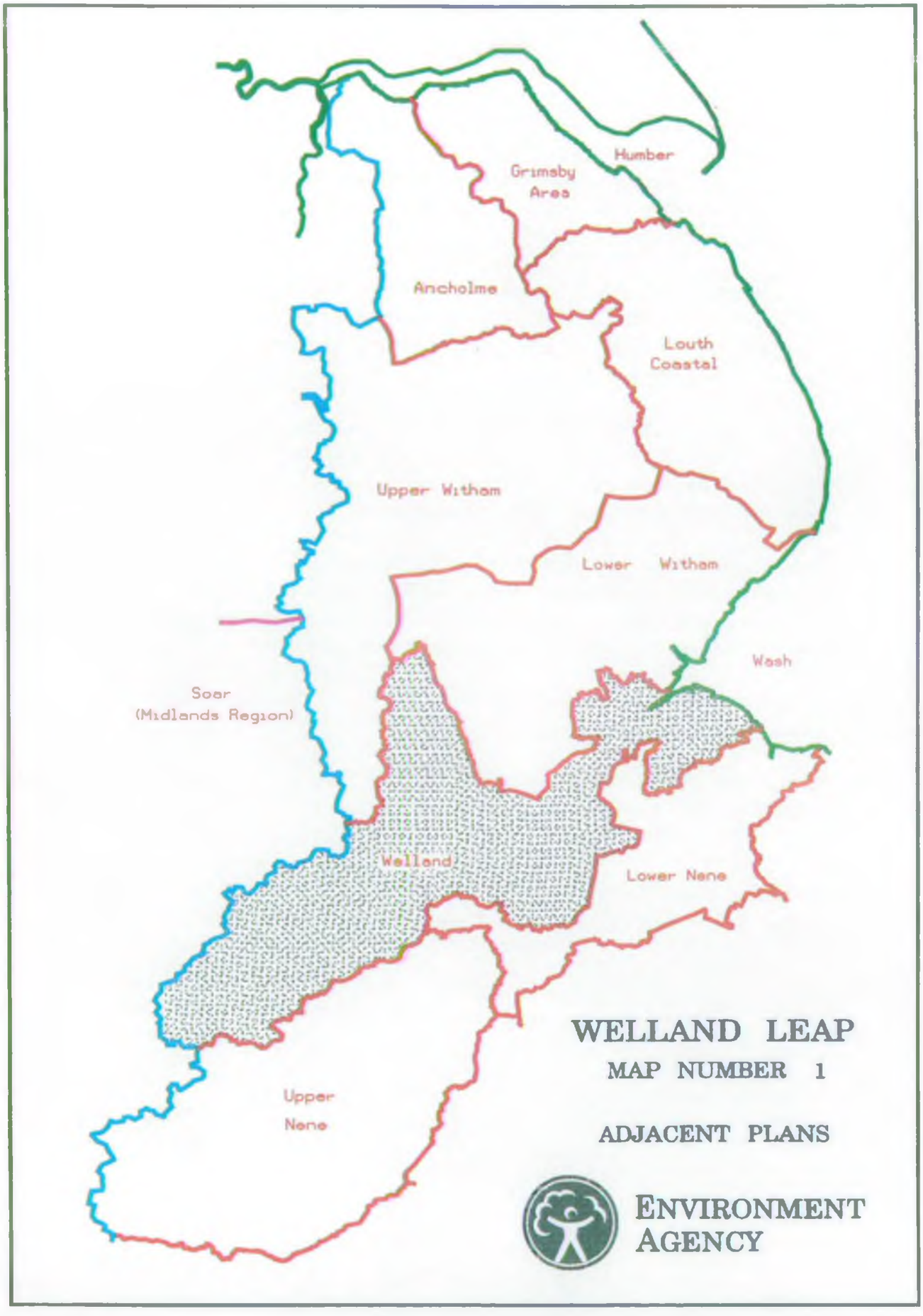
We would also like to use this opportunity to ask the public to comment upon the water quality targets as set out in the body and appendices of this document. It is important that long-term objectives reflect the likely uses of the watercourses in the area and a public view on the potential uses for specific watercourses would be valued.

Your responses should be returned to the address on the front cover no later than September 16th 1997.

I would like to thank the individuals and organisations who have contributed to the development of the Plan to this stage, particularly members of the Welland and Nene Area Environmental Group - our customer consultative committee who advise us on the development of LEAPs.

You should be aware that this is one Plan, in a series of 10 we have, or are in the process of developing, which cover our work in this Area, (see **Map No. 1**). If you would like copies of other Plans please contact us at the address referenced above.

Ron Linfield
Northern Area Manager



WELLAND LEAP

MAP NUMBER 1

ADJACENT PLANS

ENVIRONMENT AGENCY

Key Facts

Total Area: 1656 km^2
Population: 125 000 (approximate)
Main Towns (populations):

Market Harborough	17 069
Stamford	18 627
Spalding	21 111

Environment Agency Organisation:
Anglian Region (Northern Area) Area Office at Lincoln.
Catchment Offices (Welland & Nene) Spalding and Kettering
Water Utility Companies
Anglian Water Services Limited, Severn-Trent Water Limited
Internal Drainage Boards
Welland and Deepings, South Holland, North Level

Length of Statutory Main River:	413 km
Length of Navigable River:	75 km
Length of Course Fishery:	448 km
Length of Trout Fishery:	250 km
Length of Embanked Fluvial River:	90 km
Length of Embanked Tidal River:	22 km
Length of Sea Defence:	33 km
Area of land below sea level:	430 km^2

Flood Storage Reservoirs:

Crowland & Cowbit Washes		Medbourne
Great Easton	Little Bowden	Braybrooke

Water Quality

Biological Quality Grades 1995		Chemical Quality Grades 1995	
Grade length of river	(km)	Grade length of river	(km)
'very good'	115.6	'very good'	10.5
'good'	173.8	'good'	135.5
'fairly good'	19.5	'fairly good'	128.6
'fair'	32.5	'fair'	22.5
'poor'	0	'poor'	44.3
'bad'	2	'bad'	2

Integrated Pollution Control Authorisation Sites:

Castle Cement, Ketton	Tungstone Batteries, Market Harborough

Sites of Special Scientific Interest: 56
Scheduled Ancient Monuments: 130
Waste Management:

Licensed Landfill Sites	12
Licensed Transfer Stations	4
Licensed Treatment Plant	3
Licensed Scrap yards	11

FOREWORD

The Environment Agency was formed on 1 April 1996 and inherits the many and varied functional responsibilities of the National Rivers Authority, Her Majesty's Inspectorate of Pollution, the Waste Regulatory Authorities, and also some technical units of the Department of the Environment. Our principal aim is to protect and enhance the environment as a whole, in order to play our part in attaining the objective of sustainable development and to take a much wider view of environmental regulation and management than was possible individually for our predecessors. We have responsibility in England and Wales for:

- Regulating industrial processes with the greatest polluting potential, using a regime of Integrated Pollution Control;
- Advising the Environment Secretary on the development of the Government's National Air Quality Strategy, and providing guidance to local authorities on the strategy and their local Air Quality Management Plans;
- Regulating the disposal of radioactive waste, including nuclear sites and the keeping and use of radioactive material;
- Regulating the treatment and disposal of controlled waste, involving waste management sites and carriers;
- Implementing the Government's National Waste Management Strategy in our waste regulation work;
- Preserving and improving the quality of rivers, estuaries and coastal waters through our pollution control powers, including water discharge consents and regulation of sewage works;
- Action to conserve and secure proper use of water resources, including licensed water abstractions;
- General supervision of all matters relating to flood defence;
- Conserving the water environment and promoting its use for recreation;
- Maintenance and improvement of salmon, trout, freshwater and eel fisheries, including issue of angling licences;
- Maintaining and improving non-marine navigation, including boat licensing;
- Regulating the management and remediation of contaminated land designated as special sites; and
- Providing independent and authoritative views on a wide range of environmental issues.

In order to further the objectives of sustainable development it is clearly important to increase general and public awareness of the various issues involved. This document marks the start of that process by inviting the public and all organisations with an interest in the environment to comment on its contents, to identify their concerns for the Welland Plan area and to suggest options for their solutions.

The Agency works towards Sustainable Development through seven objectives, set by Ministers:

- An integrated approach to environmental protection and enhancement, taking into consideration the impact of activities on natural resources;
- Delivery of environmental goals without imposing disproportionate costs on industry or society as a whole;
- Clear and effective procedures for serving our customers, including the development of single points of contact with the Agency;
- High professional standards, using the best possible information and analytical methods;
- Organisation of our own activities to reflect good environmental and management practice, and provision of value for money for those who pay our charges, as well as for taxpayers as a whole;
- Provision of clear and readily available advice and information on our work;
- Development of a close and responsive relationship with the public, local authorities and other representatives of local communities and regulatory organisations.

We have chosen to continue the concept of Catchment Management Planning which was developed by the former National Rivers Authority, to help achieve our aims. With the increased scope and responsibilities of the Agency, however, these Plans will embrace issues relating to air and waste within the catchment, in addition to the water environment and will be known as Local Environment Agency Plans (LEAPs). A LEAP will seek to identify and resolve problems within a catchment in an integrated way, developing a partnership approach, where appropriate, towards dealing with those problems.

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PART I

1.0 THE LEAP PROCESS

In producing the LEAP, we recognise that to achieve our objectives we must work with, or seek to influence central government, local government, industry, commerce, the farming community, environmental organisations, riparian owners and the general public.

The preparation of a LEAP will require us to:-

- identify the current state of the environment and activities within the Plan area which impact upon it;
- set environmental targets which ensure that uses occur in ways which are sustainable and do not impact unacceptably upon other uses;
- identify shortfalls against existing targets, along with other issues of concern;
- undertake consultation on the targets, issues and options;
- prepare an Action Plan to address the issues;
- implement the Action Plan and maintain on-going monitoring and review of the Plan.

Through detailed consultation with all interested organisations, we seek to:

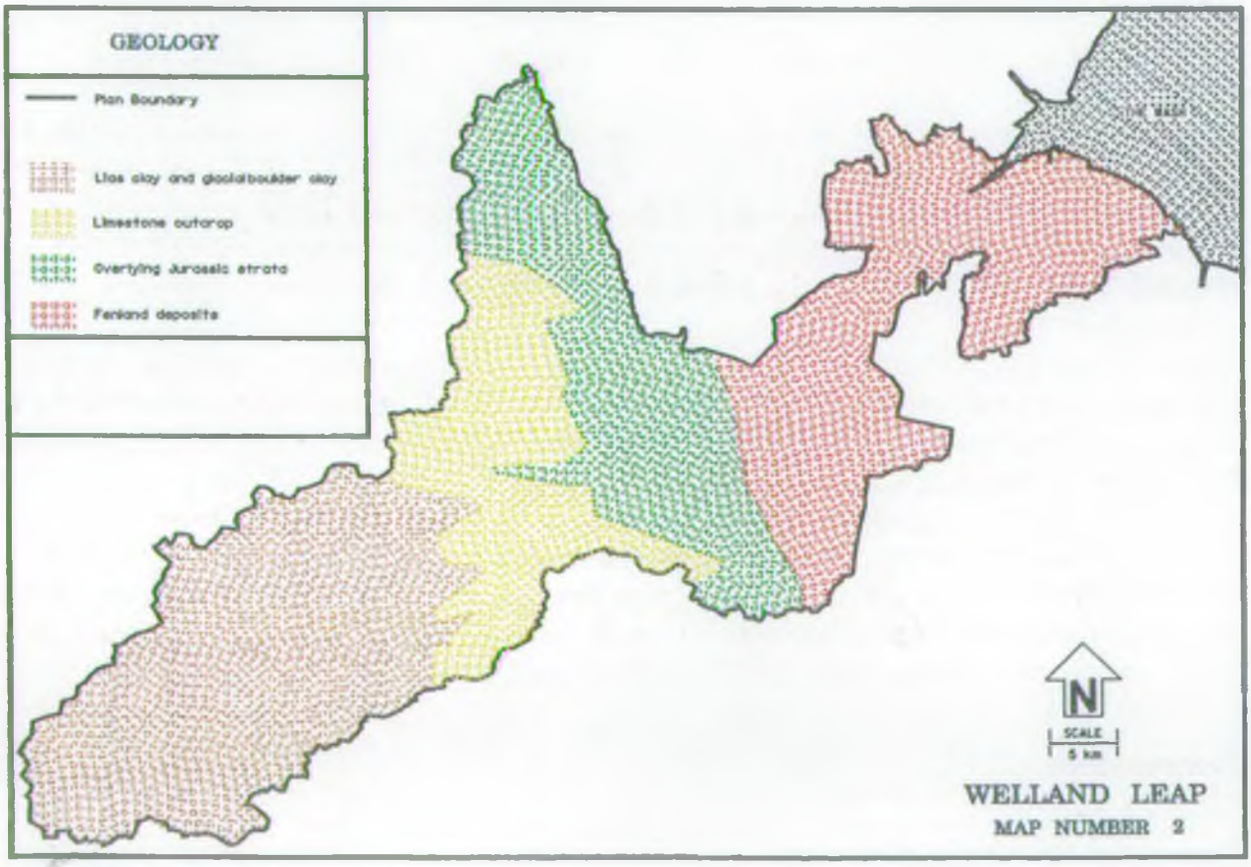
- confirm the range and extent of plan uses and activities;
- obtain views on the issues facing the environment and on options to resolve them;
- begin the process of identifying Action Plans;
- form partnerships to sustain local resources and resolve issues;
- ensure decisions on the future management of the Plan Area take account of views expressed from interested parties.

The publication of this consultation report marks the start of a three month period of formal consultation. This will enable external organisations and the general public to work with us in planning the future of the environment in the Welland Plan area.

Following the consultation period we will produce an Action Plan which will form the basis for both the Agency and other partners' actions within the Plan area over the following 5 year period. We will seek the commitment to planned actions by others where necessary. A summary of the LEAP process and relevant timescales for the Welland LEAP are shown in Figure 1.

Figure 1: The LEAP Process and Welland LEAP Timetable

Agency LEAP Team Formed	September 1996
Agency identify plan area uses, current state, targets and shortfalls against targets	
Pre-Consultation with: - Water Companies - Conservation Interests - Planning Authorities - Angling Interests - Industry - National Farmers' Union - and other key partners	November 1996
< Feedback	
Completion and Publication of Consultation Document	June 1997
Public Meeting	July 1997
< Feedback	
Agency produce Action Plan with 5 Year Horizon	December 1997
Annual Monitoring	Ongoing 1998 -
Review	2002



2.0 CATCHMENT AREA

The Plan area for the Welland LEAP extends from the headwaters of the River Welland near Market Harborough in Leicestershire to the Wash Estuary along the Lincolnshire coastline. It includes the sub-catchment of the River Glen which rises in the Lincolnshire Limestone ridge east of Grantham. Major towns include Oakham, Stamford, Spalding, Market Harborough and the northern fringe of Peterborough. The natural catchment area of this Plan includes part of the Wash Estuary for which we are also producing a LEAP. Whilst reference to the Wash will be made in this document, any issues pertaining exclusively to the seaward side of the flood defence line will be reserved for that Plan.

The landscape of the area is one of significant contrasts. To the west of Stamford the catchment is hilly with the Welland's major tributaries such as the Chater and Gwash cutting valleys into the underlying Lias clay strata. The Welland itself has a broad flood plain which narrows as the river cuts through the Limestone ridge which traverses this area along the line between Grantham to Stamford and beyond.

The upper river valley was once famous for its grazing pastures. These, however, have increasingly been drained and brought into cultivation which has resulted in a landscape of straightened meanders, lost water meadows, and scarce tree cover. Remnants of Rockingham Forest remain along the higher ground of the Welland valley where the land is unsuitable for cultivation. The surviving remnants of this ancient woodland form important habitats for invertebrates, plants, birds and animals.

A feature of this area is the use of limestone as the main building material with churches, farms and the majority of the villages being built in this attractive material. The Welland is spanned by a number of bridges built from limestone, many of which, such as Duddington, are listed monuments. A famous landmark just upstream of Stamford is the Harringworth viaduct, which was built in the last century. This impressive structure has some eighty arches and still bears rail traffic today.

To the east of Stamford the hills flatten out to form the entirely different landscape of the Fens, as the Lincolnshire Limestone dips gently towards the Wash and becomes progressively overlain by younger Jurassic strata and more recent alluvium deposits. Around Market Deeping extensive river terrace sand deposits occur which are extracted for construction purposes whilst further east the area is covered by peat and alluvium Fenland deposits.

The Fens have a long, complex and fascinating history of flood, settlement and drainage. Early settlers lived and worked with nature, reaping a reward from fishing, wildfowling and the lush summer grazing for their stock. The Romans sought to tame the tide and claimed marshland from the sea with some success. In the 17th century, following a succession of persistent floods, a royal charter was prepared that established the legal framework for the draining of the 'Great Level' which was to change the whole character of the area. The resulting drainage system, which was imposed on the landscape, brought undoubted wealth to the area which continues to this day. However it also fundamentally changed the landscape from one of extensive wetland

and marsh, rich in wildlife, to the highly productive arable area we know today with its limited conservation value.

Since 1600, some 97% of the original wetlands have been lost and Fenland species have been confined to smaller and smaller sites. Despite this, habitats still exist which provide a foothold for relict species. These include wetlands including fen, marsh and reedbeds which are characterised by common reed, saw sedge and fen violet and support a range of wintering birds such as the reed warbler and bearded tit; and open water where there exist a range of plants such as fen pondweed and ribbon leaved water plantain which support healthy coarse fish populations. Otters and water vole are present in the catchment but their numbers are unknown. More habitat is needed to sustain these remnant populations for which the water environment is so important.

In contrast, that part of the Plan area which forms part of the Wash Estuary is rich in wildlife. The Wash is internationally important for its nature conservation value. It gains national recognition as a Site of Special Scientific Interest (SSSI) and international recognition as a Special Protection Area - SPA (EC Conservation of Wild Birds Directive 79/409) and as a Ramsar Convention Site (Wetland of International Importance). Some areas of the Wash are managed as a National Nature Reserve whilst others are managed as nature reserves by voluntary conservation bodies. The Wash is also a proposed Marine Special Area of Conservation (SAC) under the Habitat Directive for its intertidal and subtidal sand, mud flats and seals, which on occasions have been known to visit the inland river systems in search of food (to the distress of local anglers).

The Welland Valley in Rutland

Somewhere in the order of 95% of the Plan area is currently used for agricultural purposes, most of which falls into MAFF's best and most versatile land classifications. The agricultural industry and associated business is thus of fundamental importance to the economic welfare of the area. Over much of the area, but particularly in the east, the highly productive potential of the land is in part realised as a result of the installation of a comprehensive network of pumped and gravity fed land drainage and field drainage systems. Given the rural nature of most of the area there is little evidence of contaminated land. The larger landfill sites currently operating on the outskirts of Peterborough are constructed on the containment principle and consequently pose little threat to the environment.

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.

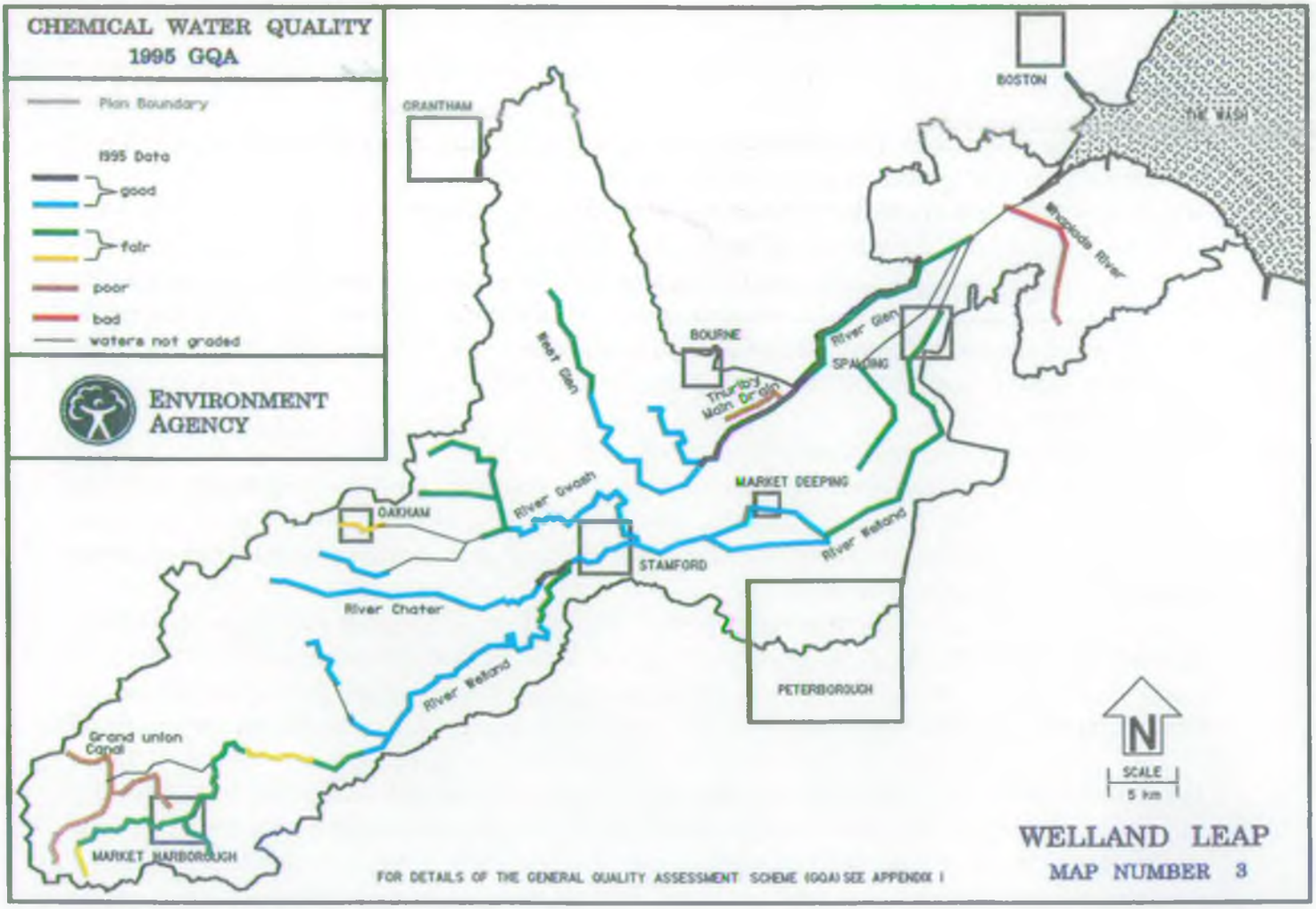
The principle sources of water are the River Welland, Rutland Water Reservoir and the Southern Lincolnshire Limestone aquifer. There is also some water available locally from extensive gravel deposits north of Peterborough.

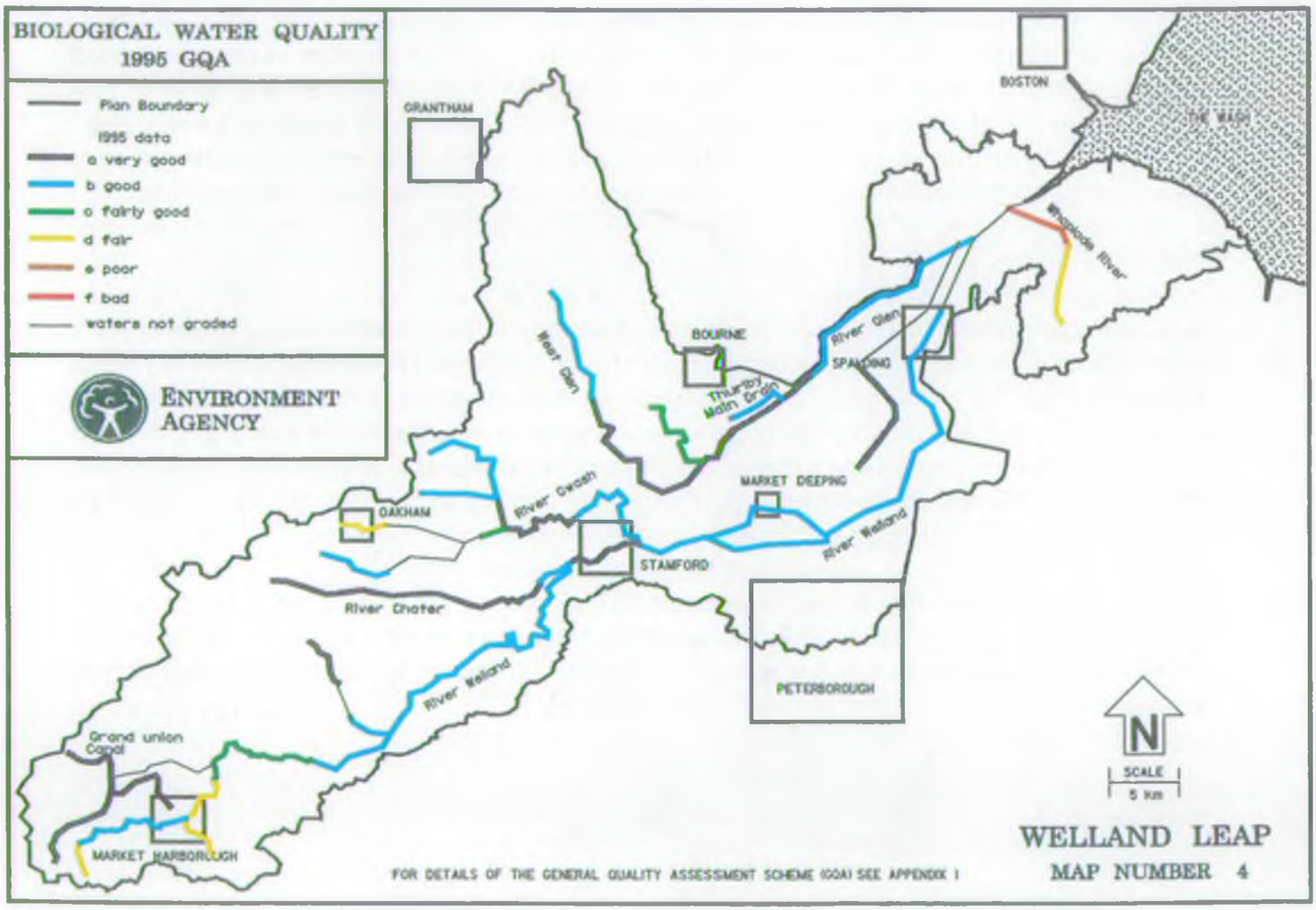
The Lincolnshire Limestone aquifer in this area supports five significant public water supply abstractions, along with others for agricultural purposes. The recent run of dry summers and winters has begun to place this resource and the watercourses it supports under some stress, necessitating augmentation of river flow in the Bourne Eau and the Glen River.

The upper river catchment contains two important reservoirs, Rutland Water, which takes its water from both the Welland and Nene, and Eyebrook Reservoir which supplies the nearby steel town of Corby. Rutland Reservoir is owned by Anglian Water Services and is the largest reservoir operated by the company. In conjunction with a number of other pumped storage reservoirs located in adjacent catchments it forms part of the Ruthamford water supply system which supplies water to domestic and industrial customers in this and adjacent catchments.

The establishment of this large reservoir has created a major wetland area which combines extensive sheets of open water with a complex of wetland and lakeside habitats, including lagoons, marsh, meadows and mature woodland. The diversity and management of these habitats have made it one of the richest reservoir locations for wintering and passage wildfowl in Britain particularly notable for its populations of gadwall, teal, widgeon, pochard and tufted duck (amongst others). Rutland Water has been designated a SSSI, RAMSAR site and SAC. It is also of significant value locally from a recreation point of view. Trout fishing, sailing, cycling and wind surfing are just a few activities which take place at this location.

With the exception of one cement processing works operated by Castle Cement at Ketton and a lead works in Market Harborough operated by Tungstone Batteries, there is little "heavy" industrial activity in the area. Around Spalding, food processing factories are operated by Christian Salversons and Geests; and in Market Harborough "light" industry includes engineering and plastics.


CHEMICAL WATER QUALITY
1995 GQA
Plan Boundary
1995 Data
good
fair
poor
bad
waters not graded
ENVIRONMENT AGENCY
GRANTHAM
BOSTON
THE WASH
Witham River
BOURNE
River Glen
SPALDING
West Glen
Thurlby Main Drain
MARKET DEEPING
OAKHAM
River Gwash
STAMFORD
River Welland
River Chater
PETERBOROUGH
Grand union Canal
MARKET HARBOROUGH
N
SCALE
5 km
WELLAND LEAP
MAP NUMBER 3
FOR DETAILS OF THE GENERAL QUALITY ASSESSMENT SCHEME (GQA) SEE APPENDIX 1


BIOLOGICAL WATER QUALITY
1995 GQA
Plan Boundary
1995 data
a very good
b good
c fairly good
d fair
e poor
f bad
waters not graded
ENVIRONMENT AGENCY
GRANTHAM
BOSTON
THE WASH
Witham River
BOURNE
River Glen
SPALDING
West Glen
Thurlby Main Drain
MARKET DEEPING
OAKHAM
River Gwash
STAMFORD
River Welland
River Chater
PETERBOROUGH
Grand union Canal
MARKET HARBOROUGH
N
SCALE
5 km
WELLAND LEAP
MAP NUMBER 4
FOR DETAILS OF THE GENERAL QUALITY ASSESSMENT SCHEME (GQA) SEE APPENDIX 1

The quality of rivers in the area is generally good to fair as shown on the maps numbers 3 and 4. River Quality Surveys carried out for the years 1988-95 indicate that surface water quality within the Plan area is improving and that the current quality is better than at any time since the early 1980's. Despite this a number of watercourses suffer from the consequences of low flows and eutrophication, notably the Grand Union Canal and the Welland downstream of the Folly River. The headwaters of the Welland suffer from both low flows and contaminated urban water run-off. The upstream stretches of the Welland's tributaries are generally unpolluted and able to support native brown trout and grayling populations.

Groundwater quality is generally good, and unlike other agricultural areas in Eastern England it has not been deemed necessary to designate areas of land as Nitrate Vulnerable Zones.

Local groundwater pollution incidents do occur however, with the most serious one in this area being contamination of part of the Lincolnshire Limestone aquifer around Helpston by leachate from closed landfill sites. This situation is being monitored by both ourselves and Anglian Water who abstract water locally.

Flood defences in centres of population such as Stamford and Market Harborough are provided by lengths of flood wall and embankment. Between these two population centres the Welland valley is characterised by a fairly broad flood plain. The villages of Medbourne, Great Easton, Braybrooke and Little Bowden have a history of flooding and the defences here are provided by flood storage reservoirs sited upstream.

To the east of Stamford and Bourne the Welland and Glen flow through the low lying fen land, generally in embanked channels at a level often significantly above the surrounding land. There are no natural flood plains and the flood defence is provided by the embankments supplemented in certain locations by flood relief channels such as the Coronation Channel at Spalding. The Crowland and Cowbit Washes form a significant area of flood storage upstream of Spalding. They were first engineered in the 17th Century and protect Spalding from flooding during periods of tide-lock. The Washes have not been used since 1947 and are now cultivated for arable farming. The low lying fens are drained by a network of channels and pumping stations maintained by three Internal Drainage Boards.

Downstream of Spalding the Welland is tidal over a distance of 22 km to its outfall into the Wash at Tabbs Head. The River Glen flows into the Welland at Surfleet where there is a tidal sluice. Three major IDB drains also outfall in this length. The defence against flooding here is provided by earth embankments which themselves are protected against erosion damage by stone protection within the channel and a berm. The sea defence frontage is also an earth bank which is afforded protection by the presence of a salt marsh of varying width in front. The standard of protection offered by the existing tidal defences is 1 in 100 years or higher.

As a fishery, the Welland is a typical East Anglian river and its fish populations are influenced by the surrounding geography. From its source upstream of Market Harborough to below Stamford, angling is for chub, dace and roach. Some trout fishing is practised on streams such as the Eyebrook and the River Gwash (all the tributaries of the Welland hold populations of native brown trout).

Below Tallington, on the Welland, the river becomes wider and angling becomes more sedentary. The wide Welland is an important venue for match fishing and the main species sought are bream, roach and pike.

Recreational use within the area is low especially when compared with the use of the nearby Nene. Exceptions to this are Rutland Water and the river corridor in Stamford which are heavily used, particularly during the summer months. Although informal recreation takes place throughout the rest of the catchment, it is at a much lower level and is constrained by access restrictions and a lack of facilities.

Boats on Rutland Water

3.0 ISSUES

The purpose of this and the subsequent section, Protection Through Partnership, is for the Agency to report the Issues we have identified in the Plan area, in our preliminary discussions with partner organisations, to make known our thoughts on how we might act to remedy them, and to identify a range of alternative options which should also be considered. Where known, our preferred option(s) for issues are shown in italics.

We request the reader to consider these issues and proposed solutions and to comment upon them: have we found the right solution?; are there others we haven't identified?; are there benefits/disbenefits we haven't taken into account?; and are there Issues we have overlooked?.

Your comments will be taken into account when in 6 months time we set out an Action Plan to progress the Issues identified herein.

Summary of Issues

Issue 1a The measurement of flows along a number of watercourses in the area is inadequate to effectively manage potential flood events.

Issue 1b The measurement of river flow on a number of watercourses in the plan area is inadequate to properly measure low flows and effectively manage river transfers.

Issue 2 The standard of flood defence at certain locations fall below current target standards.

Issue 3 Siltation of river outfalls and tidal structures impact on flood defence standards and affect the navigational use of waterways in the catchment.

Issue 4 There is concern that the current management of compensation flow from Rutland Water is not fulfilling the in-river needs of the River Gwash.

Issue 5 The area of natural wet fenland habitat in the catchment has been reduced to less than 1% of historic level.

Issue 6 Properties upstream of the tidal sluice at Surfleet are at risk of flooding during periods of tide lock.

Issue 7 The population of native crayfish in middle reaches of the Welland, Lower R. Chater & R. Gwash are under increasing threat from non-native species.

Issue 8 The discharge consent conditions for a number of STW discharges will not protect downstream water quality if significant development occurs within the catchment.

Issue 9 Inadequate local sewerage systems in some villages result in localised pollution and/or public health problems.

Issue 10 Nutrient enrichment of water bodies in the Plan area impacts on water quality and affects flora and fauna and other uses of water eg. navigation, amenity and fishing. River ecosystem quality targets can be compromised.

Issue 11 Leachate from contaminated land near Helpston is affecting groundwater quality in the Lincolnshire Limestone aquifer.

Issue 12 Fish movement between river stretches are hampered by river control structures.

Issue 13 The navigation potential of the catchment is currently being under utilised.

Issue 14 The stability of the Welland outfall channel and flood defences are threatened by the activities of large boats in the channels.

Issue 15 Routine biological and chemical monitoring has revealed a problem with water quality at a number of sites/stretches in the Plan area.

Issue 16 Losses of water from certain stretches of the River Glen are inadequately understood; this impacts upon the effectiveness and operation of the River Gwash to River Glen river transfer scheme.

Issue 17 Baseflows in some watercourses south of Bourne have been reduced by the sealing of 'wild' boreholes which are believed to have impacted on environmental and other uses

Issue 18 Land drainage and agricultural practices have significantly reduced habitat diversity within rivers and their flood plains.

Issue 19 The demand for water from the lower Welland exceeds available river flows in dry summers.

Issue 20 The use of the Maxey Cut as a fishery and as a source of water for summer irrigation are not sustainable.

Issue 21 Concern has been raised over local derogation/overcommitment of resources within the Southern Limestone aquifer.

Issue 22 The burning of wastes at cement and lime plants is of national and local concern.

ISSUE 1a

The measurement of flows along a number of watercourses in the area is inadequate to effectively manage potential flood events.

Background

We operate a network of gauging stations which continually monitor levels and flows. Many of these stations are linked to a computerised flood warning system by way of telemetry. This system allows river levels and flows to be monitored and advance warning of flooding to be provided to the public and media.

A recent survey of this telemetry system has identified the need for river flow gauging improvements throughout the Region for flood defence as well as water resource needs. Deficiencies in the river gauging network have been identified in the Welland Plan area. Gauging of high flows is deficient for the purposes of providing flood warnings. Provision has been made for improvements to existing gauging stations and construction of new gauging stations with telemetry links.

Effects

Inadequate data on river flows and levels during flood events, reduces our ability to manage such events properly and reduces the advance notice and information we can give to the public of such an event.

Options	Responsibilities	Advantages	Disadvantages
Construct a new river gauging station on the R. Welland in Market Harborough and provide improvements to gauging sites on the R. Jordan at Little Bowden and the R. Glen at Kates Bridge.	*Environment Agency*	*Improved flood warnings and flood control in respect of the R. Welland and R. Glen.*	*Cost*
Do nothing			Poor flood control and deficiencies in flood warning.

ISSUE 1b

The measurement of river flow on a number of watercourses in the plan area is inadequate to properly measure low flows and effectively manage river transfers.

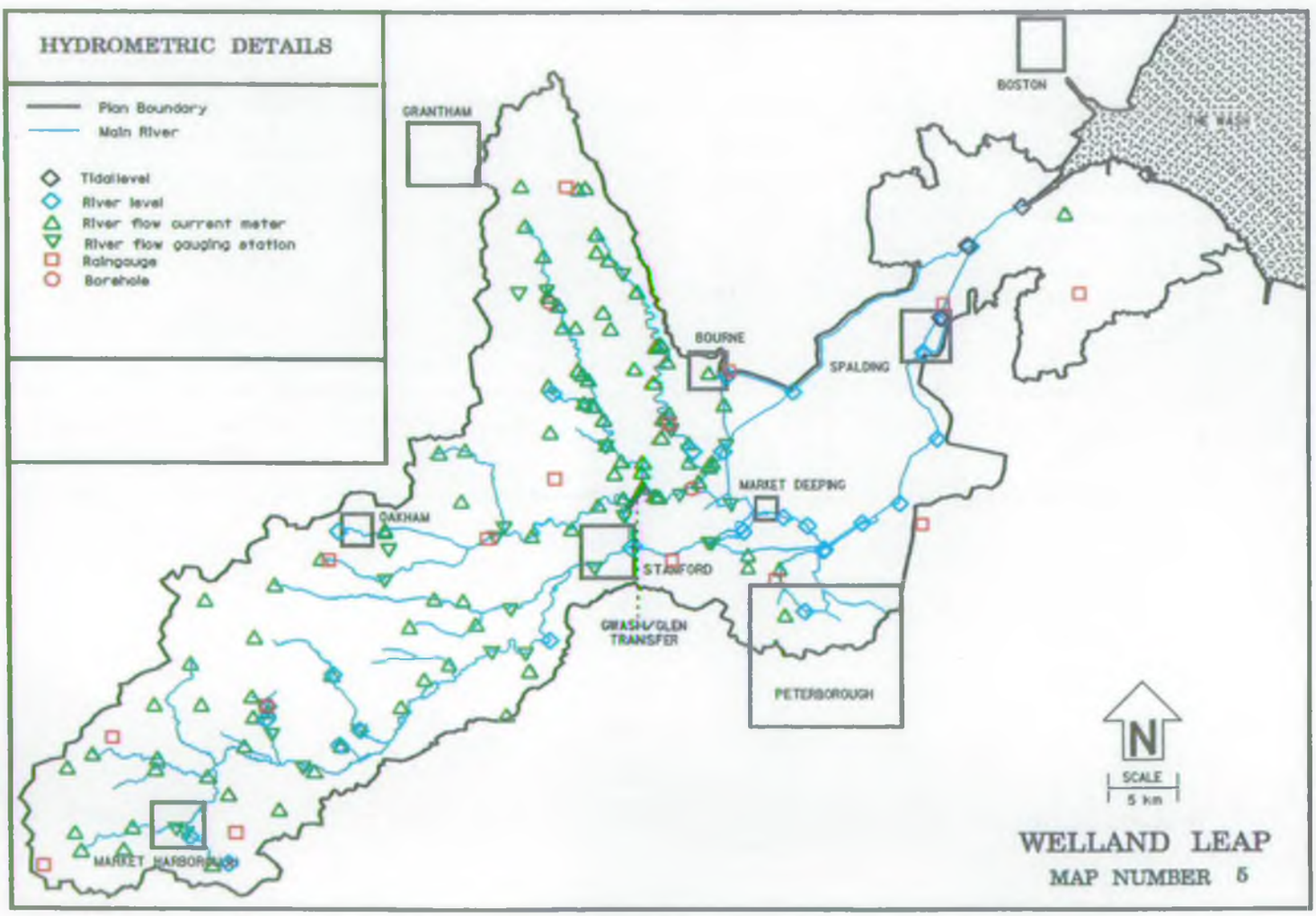
Background

The Agency measures flow at key sites on many rivers. The information gathered is used to assess the changing nature of flow over time, improve the management of river transfers and to forecast floods. (A river transfer is the movement of river water from one river to another to augment river flows; one such exists in this area, with waters being taken from the Gwash at Ryhall and pumped into the adjacent Glen via a pipeline).

Effects

Problems in gauging low flows at Belmesthorpe on the River Gwash may result in inefficient operation/management of Gwash/Glen transfer scheme.

Other gauging stations need refurbishment work to maintain and improve the quality of data being gathered.



Options	Responsibilities	Advantages	Disadvantages
Improve and upgrade gauging station network.	*Environment Agency*	*Improved flow measurements and monitoring.*	*Partial solution.* *Cost*
Extend telemetry system.	*Environment Agency*	*Improved monitoring.*	*Partial solution.* *Cost.*
Do nothing			Ineffective management of resources associated with the Gwash/Glen river transfer, that will become more critical as demands increase.

ISSUE 2

The standard of flood defence at certain locations fall below current target standards.

Background

The Region has target standards of protection against flooding of land and properties which vary with the type of use to which the land is put. **(See Section 6.5.3)**. The target for urban areas for example is higher than that for agricultural land.

It is accepted that the existing flood defence standards in parts of the Plan area are below standard of service targets. This may have arisen as a consequence of changes in catchment characteristics (increased surface water run-off), because of development in the natural flood plain, because of the structural deterioration of some defences or because of their historical deficiency. In such locations a relatively small number of properties will actually be at risk from flooding.

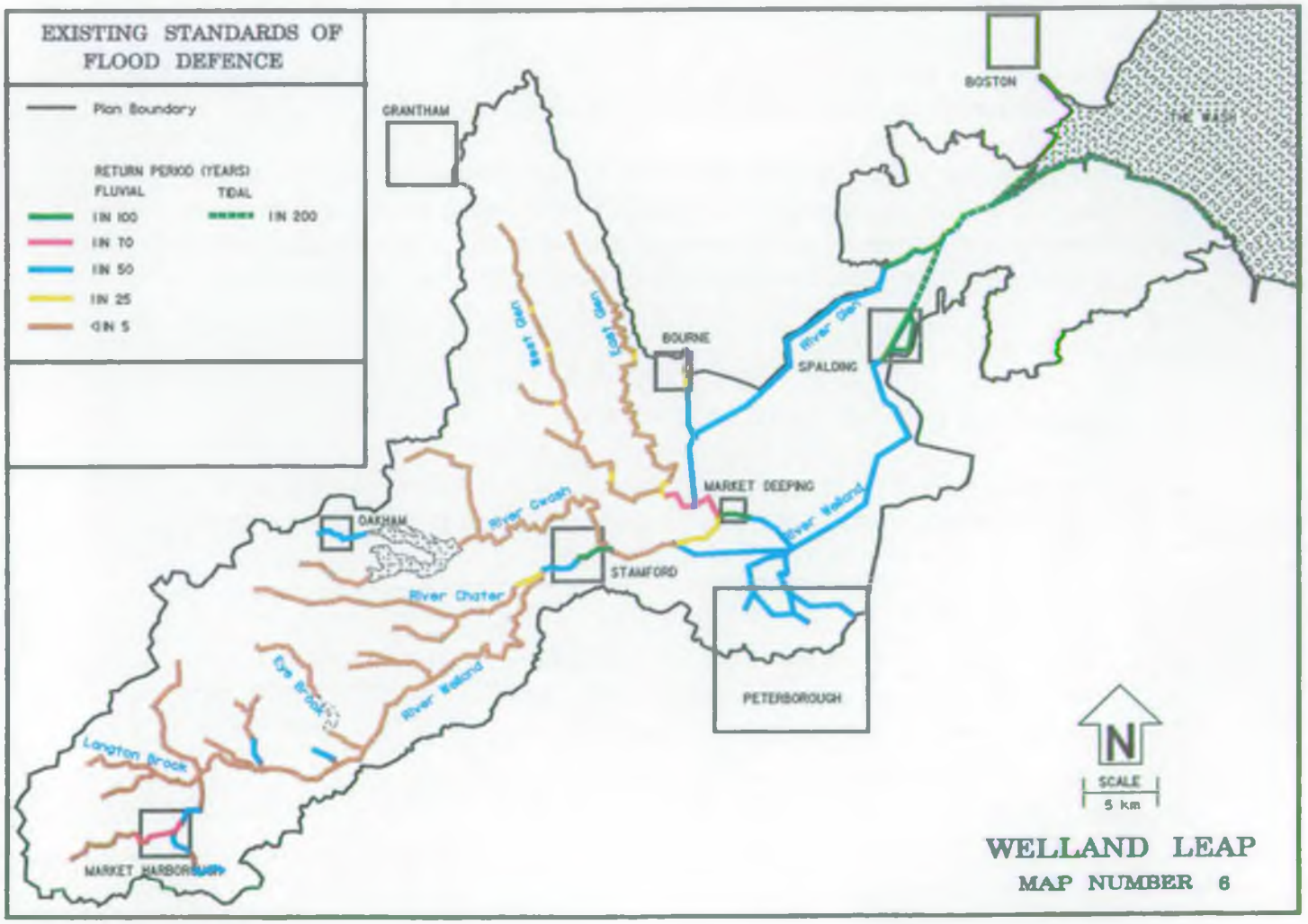
Over the years, the majority of locations where property flooding has been a problem, have been addressed by improvement works which were carried out to provide the standard of protection considered appropriate at the time. This will not always accord with current standards as in some instances target standards have been revised upwards to reflect the public's raised expectations in terms of flood protection. The standard of flood protection provided by improvement schemes we promote are to a standard which can be economically justified by benefit/cost analysis.

Effects

Market Harborough: Last flooded as a result of the River Welland overtopping in 1969 following which, a scheme was promoted which gave it a standard of protection against a 1 in 70 year flood event. The River Welland has insufficient channel capacity to carry significant flood flows. This problem is exacerbated by low ground levels in Market Harborough which creates problems with surface water which cannot freely discharge into the river channel. The target standard of flood protection for Market Harborough is notionally for a 1 in 100 year event.

Welland tributaries: A number of villages along the Glen suffer intermittent flooding. These include Castle Bytham, Little Bytham, Greatford, Corby Glen, Essendine, Edenham, Creeton and Carlby. The villages of Little Bowden, Braybrooke and Great Easton all have standards of flood defence below that of Agency targets.

Options	Responsibilities	Advantages	Disadvantages
Assess the scale of the problem and implement a local flood prevention scheme to improve the standard of defence. This will need to consider options such as: - - Raising bank levels; - channel dredging; - Provision of flood storage reservoirs, washlands, wider channels, berms etc.	Environment Agency, MAFF	Reduced risk of flooding. Consistent standard of flood defence provided.	Cost
Develop existing flood warning procedure for affected areas and provide emergency response.	*Environment Agency, MAFF*	*Cost effective solution if improved defence not justified on cost/benefit.*	*Accept existing standard of defence.* *Additional costs incurred.*
Do nothing except emergency response.	Environment Agency	Maintenance costs only.	Deterioration in defence standards. Risk of flooding.



ISSUE 3

Siltation of river outfalls and tidal structures impact on flood defence standards and affect the navigational use of waterways in the catchment.

Background

The River Welland is tidal over a distance of 22 km from its outfall in the Wash at Tabbs Head to Marsh Road Sluice in Spalding.

The outfall channel is confined within training walls, behind which the salt marsh has been gradually accreting to the point where it is now level with the top of the wall in many places. As a result, tidal movements within the Wash deposit silt into the river channel.

It is also possible that the movement of silt within the Wash is being affected by:

- the effects of erosion of the beach and underlying clays along the Lincolnshire and Yorkshire coasts;

- The Port of Boston depositing dredged material from the port and Witham Haven in the vicinity of Tabbs Head.

Accumulation of silt, especially around bends causes increased erosion, a reduction of berm widths required to protect flood banks and imposes source loads on the channel edge, inducing instability and causing slip failures and dislodging of existing stone protection.

This problem is compounded by the fact that low fluvial flows in recent years have been insufficient to carry both tidally and fluvially derived silt out to sea.

Phase 1 of the Agency's "The Wash Rivers Outfall Study" which analysed the siltation problem and sets out a strategy for its control has recently been completed. A number of options were considered such as the use of training walls, channel re-alignment, dredging, additional land drainage pumping, new sluices and tidal/fluvial flushing.

Effects

The degree of siltation which has occurred is such that:

- the efficiency of the three tidal structures, located at Marsh Road Sluice, Surfleet Seas End Sluice and Fulney Lock, has been reduced. There is currently in excess of 2 metres depth of silt in front of the tidal sluice at Marsh Road;

- there is now a genuine concern that the tidal channel will be unable to discharge a major fluvial flood flow which might lead to a requirement to utilise the Crowland and Cowbit Washes to store peak flows for the first time since 1947. This would have very serious

consequences for the intensive agricultural activities presently sustained within the Washes.

- gravity outfalls from Internal Drainage Board carriers and the River Glen can be restricted as a result, with similar consequences;

- continuing siltation could potentially affect the commercial viability of Fosdyke Port and could inhibit the passage of pleasure craft into the freshwater system.

Options	**Responsibilities**	**Advantages**	**Disadvantages**
Implement recommendations of the River Outfalls Study: - *maintenance of training walls;* - *periodic raising of training walls;* - *dredging of navigation channels by port operators.*	*Environment Agency, Port Authority, Local authorities, MAFF ?*	*Integrated management of defence.*	*Cost.* *Potential impact on the local conservation area of the Wash.*
Consider siltation effects in determining minimum residual flow to tide.	Environment Agency	Reduced siltation downstream of tidal doors. Balances competing physical and ecological demands for water.	
Do nothing			Continued siltation. Impeding gravity outfalls leading to an increased need to pump. Further navigation restrictions. Potential need for Washlands.

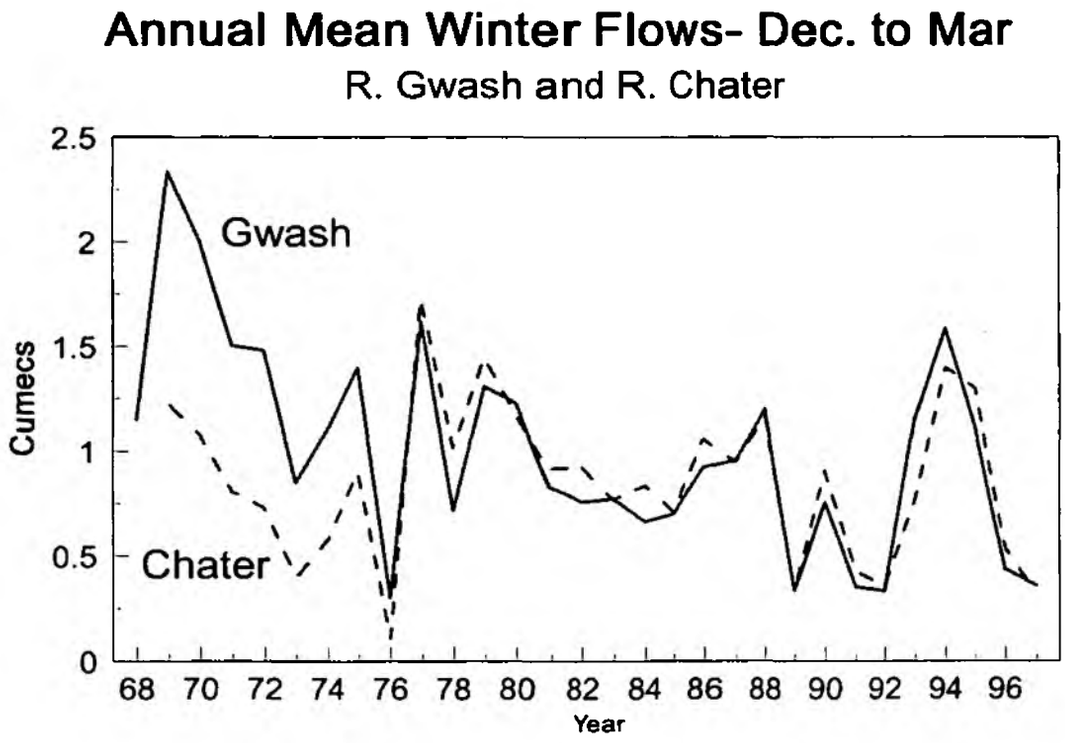
ISSUE 4

There is concern that the current management of compensation flow from Rutland Water is not fulfilling the in-river needs of the River Gwash.

Background

Rutland Water reservoir was constructed in the early 1970's to fulfil the needs of the public water supply network in the East Midlands. It takes it's water primarily from the rivers Nene and Welland but also receives flows from the Gwash.

The graph below shows flows in the adjacent Gwash and Chater catchments. Prior to the filling of Rutland Water circa 1976 the flows in these watercourses had mirrored each other, as flows in the Gwash rose and fell, so too do those in Chater with flows in the larger catchment of the Gwash being the higher of the two. Since it's construction and filling, the natural winter flow in the River Gwash downstream of the reservoir, has been reduced (it now has a similar flow rate to that of the Chater) and spate flows no longer occur. The outflow from the reservoir is now strictly regulated and although some variation in flow does occur, (for example, flow is increased



when the Gwash/Glen transfer scheme operates), this does not simulate the natural flow regime.

Since the reservoir was commissioned, the character of the Gwash has changed significantly. Out of bank flow is now an extremely rare occurrence and where this does arise it is normally as a result of a local obstruction within the channel. Conversely, because of the regulated

discharge from the reservoir, summer flows in the Gwash may be higher than "natural" summer flows.

Effects

It is believed that reduced flow rate and velocity has been directly responsible for an increase in siltation, reduction in channel width and reduced in-stream habitat diversity such as "riffle and pool" sequences. In several locations, silt blocks land drainage outfalls, resulting in the waterlogging of arable fields. Weed growth has also increased in the silted areas.

Options	**Responsibilities**	**Advantages**	**Disadvantages**
Assess the impact of perceived changes in flow upon the environment. - *assess the accuracy of the perception;* - *quantify/ qualify impacts.*	*Environment Agency*	*Provides better understanding of in-river needs.* *May provide tool to aid water resource management.* *Confirm/identify stretches of river concerned and extent of the problem.*	*Cost of investigations may outweigh environmental benefits.* *Much data collection required.* *May still require RFO to be determined.*
Develop a sustainable management strategy for the R. Gwash downstream of Rutland Water.	Environment Agency Anglian Water Services	Improved management of resources.	Effectiveness of strategy compromised by the lack of understanding of the issue. Efforts may not be targeted to the best advantage.
Do nothing			Flows in some stretches may be inadequate. Impoverished physical and environmental conditions will persist.

ISSUE 5

The area of natural wet fenland habitat in the catchment has been reduced to less than 1% of historic level.

Background

Wetland sites are ecologically sensitive habitats dependent on water input from surface and groundwaters. They exist due to this water regime and topographical and geological features. There would have been over 700 kms^2 of fenland habitat in the catchment prior to the draining of the fens. This land, with its high winter water table, contained a wide variety of now very rare plants and animals. Today the remaining wetland habitat is restricted to a few reserves totalling less than 1% of the original area involved, such as at Thurlby and Baston Fens.

Fens are listed as one of the habitats in need of restoration as part of the U.K's Biodiversity Action Plan **(See Section 4.6).**

The Agency is one of the leading partners in the 'Wet Fens For The Future Project', along with the Countryside Commission, English Nature, Cambridgeshire and Lincolnshire County Councils and The Royal Society For The Protection of Birds. The aim is to seek opportunities to involve a wide range of partners to maintain, enhance and develop wetlands. The project is exploring not only the environmental benefits but also those of flood defence, water resources, recreation, landscape archaeology agriculture and economic development and tourism.

Effects

Very few such natural fenland habitats now exist in the catchment and the fragmented nature of this specialised habitat puts even greater pressure on the species which inhabit them.

Options	Responsibilities	Advantages	Disadvantages
Participate in the development and implementation of Local Biodiversity Plans. - *collaboration with landowners to restore wetland habitats;* - *support and encouragement given to fenland restoration projects.*	*Environment Agency, Landowners, FWAG, CC*	*Increased diversity of flora, fauna and habitat.* *Potential flood defence benefit, reduction in flood peak timing.*	*Cost*
Review operational management of Environment Agency owned river banks.	*Environment Agency*	*Fulfils duty under legislation to further conservation.* *Increased diversity of flora, fauna and habitat.*	*Additional costs may be incurred.*
Introduce habitat enhancements during both routine maintenance and capital works.	*Environment Agency*	*Fulfils duty under legislation to further conservation.* *Increased diversity of flora, fauna and habitat.*	*Additional costs may be incurred.*

ISSUE 6

Properties upstream of the tidal sluice at Surfleet are at risk of flooding during periods of tide lock.

Background

Surfleet Reservoir is situated on the upstream side of the tidal sluice at Surfleet where the River Glen flows into the River Welland. The original purpose of the reservoir was to store water to provide a flushing flow to scour out and remove silt from the tidal channel of the Welland, thereby increasing the efficiency of gravity discharges in the area. However, this did not prove to be a satisfactory operation and the practice was discontinued.

The reservoir is owned by the Welland and Deepings Internal Drainage Board who at some time in the past permitted the construction of a number of chalet type structures within the reservoir area. These were intended for temporary occupation only and the owners were made fully aware of the flood risk. Several of these chalets have changed hands often with the new owners being unaware of the risks involved. There are approximately 50 chalets within the reservoir many of which are now occupied on a permanent basis.

Effects

When flood flows in the River Glen coincide with higher tide levels in the River Welland, gravity discharge is not possible and the reservoir area begins to fill putting at risk a number of chalets. If levels in the Glen continue to rise through this 'tide locked' period then these chalets will flood. The last occasion on which this occurred was in 1994 when 16 chalets were flooded.

When it is predicted that such a situation will arise it is necessary for the Agency to sand bag the properties and advise evacuation.

Options	Responsibilities	Advantages	Disadvantages
Improve flood warning and provide emergency response.	*Environment Agency*	*Minimal costs. There maybe some reduction in flood damage.*	*Chalets still subject to flooding.*
Buy out chalets.	Environment Agency	Eliminates flooding of properties.	Cost.
Provide pumping station.	Environment Agency	Enables discharge to occur under tide lock conditions, thus eliminating risk of flood.	Cost.
Make owners and potential purchasers aware of the problem.	*Environment Agency*		
Provide improved flood defence protection.	Environment Agency	Reduces and/or eliminates risk of flooding .	Cost.
Do nothing except emergency response.	Environment Agency	Minimises costs.	Chalets still subject to flooding.

Surfleet Reservoir

ISSUE 7

The population of native crayfish in middle reaches of the Welland, Lower R. Chater & R. Gwash are under increasing threat from non-native species.

Background

The native White Clawed Crayfish, is an important species in the freshwater ecosystem, and a main dietary component of a number of fish species and aquatic mammals (*eg.* otters).

Since the 1970's, the national population has come under increasing threat from several non-native species, such as the American Signal Crayfish, introduced for the restaurant and aquarium trade. The spread of introduced species eliminates native populations by competitive exclusion (food and habitat), predation and disease, such species being highly aggressive, difficult to confine and carriers of so-called 'crayfish plague'. Habitat modification and management of rivers are also factors causing loss or decline in populations.

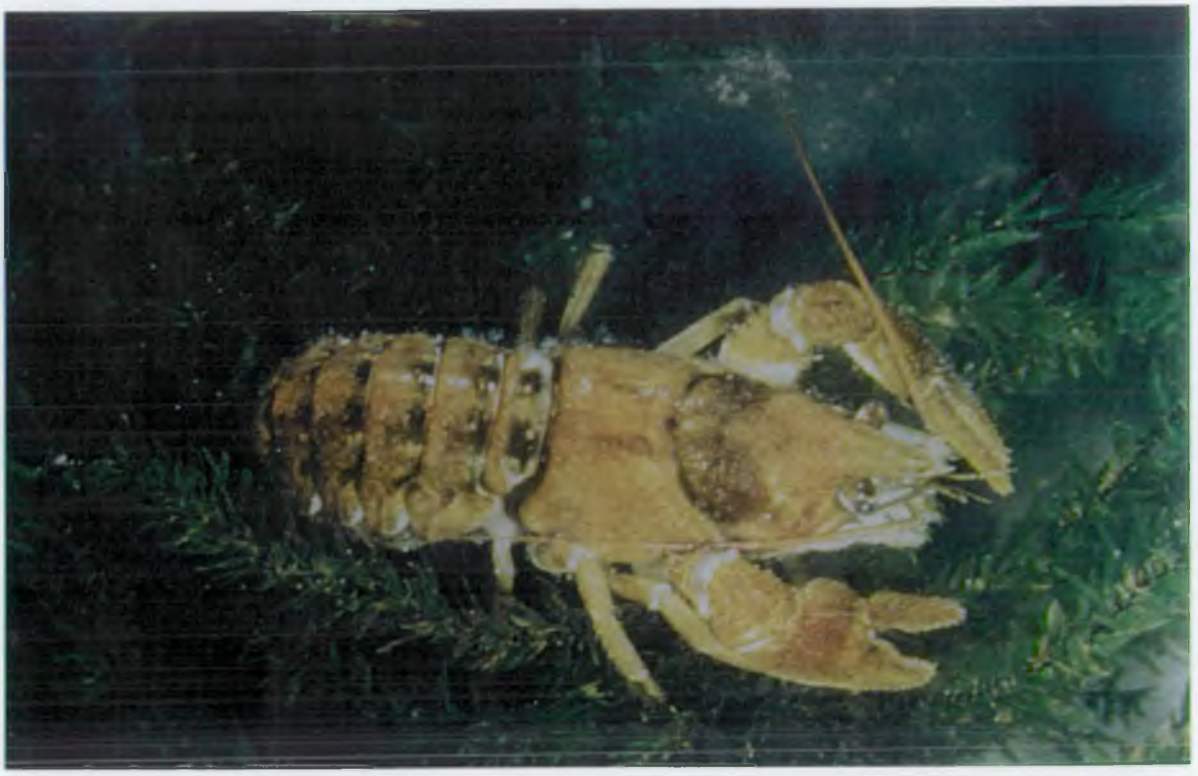
Prior to 1996, the keeping of non native crayfish had to be licensed under the Import of Live Fish Act (1980). Following a review of that legislation, to allow the commercial development of non native crayfish for the food market, the original legislation was relaxed and only certain waters with designated "significant populations" of native crayfish were protected. The differentiation between protected waters and others is administered by the designation of postal areas where licences are not required. The River Welland supports a significant native population yet is not protected by this legislation.

Native crayfish are one of the species identified for protection as part of the U.K.'s Biodiversity Action Plan **(See Section 4.6).**

Effects

Competition from non-native species, disease, and damage to habitat, places the Native Crayfish population in this area under serious risk of extinction. Several local populations of Native Crayfish have already been destroyed.

Options	Responsibility	Advantages	Disadvantages
Establish closer links with conservation organisations to monitor the spread of non native species in PE9 postal district.	*Environment Agency.* *English Nature.*	*Assist in restricting spread of non-native crayfish (avoiding consequent impact on native species) and maintain ecological balance.*	*No statutory obligation on fish-farmers etc. to consult with Environment Agency/English Nature when considering rearing crayfish in PE9 district.*
Discussions with MAFF regarding possible removal of PE9 postal district from licence exempt list.	*Environment Agency, MAFF* *DoE.*	*Reduce need for consultation process.*	*Cost.*
Develop and implement Local Biodiversity Action Plans	*Agency,* *LWT,* *English Nature* *MAFF*	*The protection of native crayfish.*	
Do nothing			Loss of Native Crayfish



Crayfish

ISSUE 8

The discharge consent conditions for a number of STW discharges will not protect downstream water quality if significant development occurs within the catchment.

Background

Currently, several Sewage Treatment Works (STWs) in the catchment are operating to a significantly better standard than that required by the discharge consent (in terms of volume discharged and/or quality of effluent). This occurs, for example, due to the provision in the consent for growth/development.

As growth occurs in the STW catchment or as STW performance approaches that required by the consent, a deterioration in water quality may result. The risk of deterioration in discharge performance in most cases is low, provided that current operational practices continue and only modest growth occurs within the sewerage catchment areas served by these STWs.

Effects

There are a number of "over performing" STWs in this catchment, but it is probable that only one (Market Harborough STW) could result in a failure of a downstream water quality objective. However, in combination with continued low flows and drought conditions, deterioration may become more marked.

Certain of the receiving waters support valuable macroinvertebrate communities, including species known to be rare in the East Midlands. Such deterioration may seriously threaten such communities, for example:

- River Welland downstream of Deepings sewage treatment works. This stretch supports the locally rare Saucer Bug, *Aphelocheirus aestivalis*, a pollution sensitive species, requiring highly oxygenated water;

- Bourne Eau and Lower R. Glen, downstream of Bourne sewage treatment works. The lower Glen in particular supports a range of unusual macroinvertebrates.

Current Agency consenting policy and planned investment, as agreed by Government during recent negotiations on water charges (AMP2), do not allow the Agency to take steps to prevent this.

Options	Responsibility	Advantages	Disadvantages
Maintain and improve effluent quality through discussion and co-operation with AWS.	*Environment Agency, AWS*	*Downstream water quality protected.*	*No obligation on AWS to maintain performance above that required in the consent.* *Additional Capex/Opex for AWS.*
Review flow data upstream of discharges to confirm dilution flows; re-calculate "protective" consent conditions, as required. *Review the rate of development.*	*Environment Agency*	*Gives confidence to the calculations of "protective" consent conditions.* *Better decision making.*	*Will not improve current risks.* *No obligation for AWS to improve effluent to meet "protective" conditions.*
Identify as priorities for future investment under next Asset Management Plan Review (AMP3).	*Environment Agency*	*Improved water quality in the longer-term.* *Cost-effective prioritisation of investment, enables compliance with long-term WQOs in the long-term.*	*Cost.*

ISSUE 9

Inadequate local sewerage systems in some villages result in localised pollution and/or public health problems.

Background

Small villages in rural areas have traditionally 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. The problem manifests itself in terms of localised pollution and public health problems. These effects are worst during periods of dry weather and low dilution flows.

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

Effects

The River Welland at Harringworth, East Glen at Braceborough and a tributary of the King Street Drain at Greatford are all locally polluted, with the resident biological life in these streams being particularly affected. In the East Glen, the pollution is extensive and long-standing, with evidence of an impact on the macroinvertebrate community as far downstream as Kate's Bridge on the main River Glen.

Local amenity value at all three sites is considerably reduced and local residents are concerned.

Recent changes in legislation enable applications to be made to AWS for the provision of a first time rural sewerage scheme, subject to certain qualifying criteria.

Options	Responsibility	Advantages	Disadvantages
Individual householders to provide adequate sewage disposal.	Householders, developers, Environment Agency	Situation improves through pollution prevention.	Cost to householder. Piecemeal solution, proliferation of individual package treatment plants, which provide less satisfactory treatment than a single larger one.
Co-operative investment in larger package treatment plant	Property owners, developers, Environment Agency	Situation improves, provides more co-ordinated approach.	Cost to householders. Such initiatives suffer delays and difficulties due to the need to set up a management company responsible for the maintenance, upkeep and other costs etc.
AWS provide first time sewerage schemes for villages affected.	*Householders, District Councils, AWS, Environment Agency*	*Improved water quality and reduction in nuisance.* *Sewerage treatment facilities provided and maintained by statutory sewerage undertaker.*	*Cost.*

ISSUE 10

Nutrient enrichment of water bodies in the Plan area impacts on water quality and affects flora and fauna and other uses of water eg. navigation, amenity and fishing. River ecosystem quality targets can be compromised.

Background

The quality of many watercourses in the Plan area are adversely affected by eutrophication. Eutrophication arises as a consequence of the enrichment of water with nutrients principally from surface water run-off from agricultural land and sewage treatment works discharges. Both the freshwater and tidal sections of the Welland, and also still waters such as Rutland Water are eutrophic.

Eutrophication is a difficult problem to solve - there are no quick or immediate solutions.

The Agency is currently developing a National Eutrophication Strategy to address this issue.

Effects

As a consequence of eutrophication, water quality and aquatic communities sensitive to nutrient enrichment become adversely affected and the aquatic ecosystem becomes ecologically disturbed, giving rise to excessive weed growth and changes in the composition of plant and animal communities. Recreational use of the waterway may also at times be compromised by these effects notably , eg. angling.

Under the Urban Waste Water Treatment Directive (UWWTD), watercourses directly/indirectly receiving a qualifying discharge (works serving populations greater than 10,000), and that fulfil certain criteria set out in DoE guidance can be designated as a Sensitive Area Eutrophic SA(E) under the UWWTD. Designation as a SA(E) would require phosphate removal to Directive standards at implicated STWs, unless it could be demonstrated that such removal would have no effect on eutrophication.

The River Welland receives several nutrient inputs from large "qualifying" STWs and both the freshwater and tidal section of the river have been identified as candidate SA(E)s requiring further review of information before status can be confirmed. The first review is in 1997.

Rutland Water is already designated as a SA(E). It has experienced frequent blooms of blue-green algae, some of which may be toxic to vertebrates. These blooms can disrupt uses of Rutland Water.

The Grand Union Canal also experiences the effects of eutrophication. However there are no "qualifying" discharges to the Canal and thus nutrient removal from sewage effluent under the UWWTD is not available (See **Issue 17**).

The diagram at **Appendix 2** illustrates eutrophic influences on our watercourses.

A. RIVER WELLAND

Options	Responsibilities	Advantages	Disadvantages
Gather/review data from rivers which show symptoms of eutrophication: *- chemical/biological monitoring;* *- Improve flow monitoring programme to assist in modelling the effect of P removal at qualifying discharges;* *- gather other information on effects of nutrient enrichment.*	*Environment Agency*	*Greater confidence in classification of eutrophic status.* *Increased understanding of potential for eutrophication process.* *Will help identify particular problem areas.*	*Possible lack of positive outcome - stretches may not ultimately be designated.*
Designate the River Welland (Freshwater and Estuary) as a Eutrophic Sensitive Area under the Urban Wastewater Treatment Directive.	*DoE*	*Designation will require removal of nutrients from major discharge inputs to the river system which will help reduce the potential for eutrophication.*	*Cost to AWS.* *Designation may not eliminate eutrophication due to nutrient inputs from diffuse sources.*
Investigate benefits of non-UWWTD driven phosphorous controls for new and existing discharges.	*Environment Agency, AWS*	*Assess requirement for nutrient reduction.*	*Cost.*
Promote good agricultural practices to reduce diffuse phosphate inputs into watercourses (eg. reductions in fertilizer application rates, the use of buffer zones, etc).	*Environment Agency/MAFF/ NFU/FWAG ADAS Agricultural community.*	*Reduces the level of nutrient originating from diffuse sources.* *Possible long-term reduction in level of eutrophication.*	*May not have desired effect in terms of reducing/eliminating eutrophication.*
Encourage the use of phosphate-free detergents.	*Environment Agency/Detergent manufacturers/ General Public*	*Reduces the level of nutrients in domestic sewage received at STWs.* *Possible long-term reduction in level of eutrophication.*	*May not have desired effect in terms of reducing/eliminating eutrophication.*

Eutrophic conditions in the River Welland at Duddington

B. RUTLAND RESERVOIR

Options	Responsibility	Advantages	Disadvantages
Develop Reservoir Action Plan to manage the problems of eutrophication at Rutland Water.	*AWS, EN, Environment Agency (initially)* *Wider local responsibilities (longer-term).*	*Brings together fragmented regulatory/ownership responsibilities to produce consistent, sustainable and cost-effective solution tailored to specific needs.*	*Time taken before positive results can be demonstrated.*
Do nothing.			

ISSUE 11

Leachate from contaminated land near Helpston is affecting groundwater quality in the Lincolnshire Limestone aquifer.

Background

Former landfill sites near Helpston, Peterborough are releasing leachate into an aquifer used for water abstraction. Extensive investigations have been carried out over the past seven years to locate the source of contamination and evaluate the impact zone and environmental significance. Leachate migration mechanisms and pathways from the landfill sites are difficult to evaluate. The hydrogeological and hydrological setting of the area is complex. Leachate migration is influenced by rainfall, a geological fault in the aquifer and abstraction. Each of these factors have positive and negative effects dependent on hydraulic conditions. The Agency continues to closely monitor the quality of surface water and groundwater within the area. Extensive toxicity and chemical testing programmes have been conducted to derive threshold protection standards for surface waters. Release of contaminated groundwater which threatens to cause exceedance of these standards can be controlled. A mathematical model is being used to assist future action programmes*. The location of Helpston landfill sites are given on **Map No. 12.**

Effects

An area of the Lincolnshire Limestone aquifer, between the landfill sites and the nearest major abstraction has become contaminated, particularly by the pesticide Mecoprop. After treatment, water abstracted from the aquifer, in this area used for public water supply continues to meet regulation standards.

Surface waters are potentially threatened by overflow from a lake at one of the landfill sites and from releases of groundwater from 'wild boreholes' (see **Issue 17**).

* In preparation for the likely Environment Agency role with respect to these contaminated land sites and an increasing pollution trend observed at monitoring points approximately 2 km from the sites (increasing trend largely due to prolonged drought conditions), the Agency are now considering a more proactive remediation strategy.

Options	Responsibility	Advantages	Disadvantages
Continue to implement the Environment Agency interim management strategy.	*Environment Agency*	*Ensures the pollution and its impacts are closely monitored and allows action to be taken to protect the environment when necessary.*	*Cost*
Develop the management tools necessary to identify a robust long term strategy.	*Environment Agency*	*Identification of a long term solution to the problem, protecting both the water resource for future use and the water environment.*	*Cost*
Require remedial action to be taken having regard for National guidance when available.	Environment Agency	Reduction of pollution load into the aquifer.	Cost
Do nothing.			Continued contamination of groundwaters and consequential loss to public water supply.

ISSUE 12

Fish movement between river stretches are hampered by river control structures.

Background

Throughout the Welland system there are many barriers to fish migration such as syphons, weirs and sluicegates. These prevent the movement of fish such as the inland migration of elvers from the sea during the spring, and the gravel seeking migrations of dace during spawning time. Various designs of fish pass are available and can be fitted to most weirs without detriment to other uses.

An example of this is the 1996 survey of Medbourne Brook either side of a flow guaging weir. Downstream of the structure fish biomass (the average weight of fish in a given area of water) was recorded as 52 grams per square metre, upstream the biomass was zero!

Effects

Barriers have led to the extinction of sea trout and elvers in the Welland and Glen and have assisted in the disappearance of certain species from specific reaches.

Options	Responsibility	Advantages	Disadvantages
Install fish passes in appropriate control structures.	Environment Agency	Permits fish to move throughout the river system.	Cost. Some depletion of water resources.
Ensure that new structures include a fish pass.	*Environment Agency*	*As above*	*As above*
Restock rivers with fish.	Environment Agency	Improved fish biomass and species diversity.	Not sustainable.
Do nothing.			

ISSUE 13

The navigation potential of the catchment is currently being under utilised.

Background

The recreational navigation use of the Welland and Glen is restricted due to deficiencies in existing facilities, such as slipways and moorings and a lack of publicity over what does exist.

Requests are frequently received from the public concerning the lack of public slipways on the non-tidal Welland and Glen. There is one private slipway on the Welland which is owned by the Spalding Yacht club, but no public slipway facility. On the Glen there is a slipway, but access is very difficult and the actual ownership is uncertain.

Effects

Underutilisation of the waterways by navigation users and potential users.

Options	Responsibility	Advantages	Disadvantages
Identify potential sites for a slipway or platform and construct.	*Environment Agency Local councils*	*Increased recreational use of waterways.*	*Possible conflicts of use. Funding.*
Do nothing.			Problem persists.

ISSUE 14

The stability of the Welland outfall channel and flood defences are threatened by the activities of large boats in the channels.

Background

The Welland's only port is at Fosdyke Bridge some 6 kms inland from it's outfall into the Wash. Up until 5 years ago it was home to a small shellfishing fleet and today it's main cargoes are imported fertilser and fish meal.

The size of the channel limits the size of craft to around 1000 Tonnes, the larger craft having to be towed up the channel.

The Wash outfalls are mainly engineered channels with berms and flood banks on either side. The berms protect the flood banks as well as providing a working platform for maintenance and emergency works.

Damage to the banks and river channels is caused by boat wash and collisions between boats and the bank whilst manoeuvring. This can lead to local irregularities in the bank which in turn give rise to eddies in the flow, promoting further scouring effects and accelerated bank instability.

Efforts to retrieve the costs of emergency bank repairs have proved fruitless as clear liability for safe entry and exit of boats from the ports is not defined. There is the need to ascertain the responsibilities of the boat owner/skipper and the Port Authority pilots.

Options	Responsibility	Advantages	Disadvantages
Develop and implement a strategy to ensure the safety of river channels and banks during the passage or manoeuvring of boats in the port approach channels and turning areas.	*Port Authority* *Environment Agency* *DoT*	*Reduced risk of damage to river banks and associated risks.*	
Establish clear liabilities for ensuring safe entry and exit from ports.	*Port Authority* *Agency* *DoT*	*Reduced risk of damage to river banks and associated risks.*	

ISSUE 15

Routine biological and chemical monitoring has revealed a problem with water quality at a number of sites/stretches in the Plan area.

Background

The River Ecosystem (RE) scheme provides, on a National basis, a set of water quality targets which the Agency uses as a basis for setting consents to discharge and in undertaking other water quality planning activities. A number of river stretches in this catchment fail to achieve their existing River Ecosystem target classes.

The majority of the marginal and significant failures against these targets relate to reduced oxygen concentrations or elevated biochemical oxygen demand which cannot be related to effluent discharges or to diffuse pollution sources. Continued low flows and drought conditions are possible contributing factors.

In some cases the chemical water quality targets set may be inappropriate (see **Appendix 3**). In addition, some sample point locations may reflect local conditions rather than the overall quality of the river stretch. A detailed review of the current situation is being undertaken to ensure that appropriate targets are set.

In general biological quality is good, however routine biological monitoring has identified certain problem sites eg. downstream of some of the smaller utility STWs (see also **Issue 9** relating to the impact of problems with inadequate rural sewerage), and stretches affected by urban run-off.

Failing stretches

A. Grand Union Canal. (Husbands Bosworth to Foxton. Foxton to Market Harborough and Foxton to Saddington.)

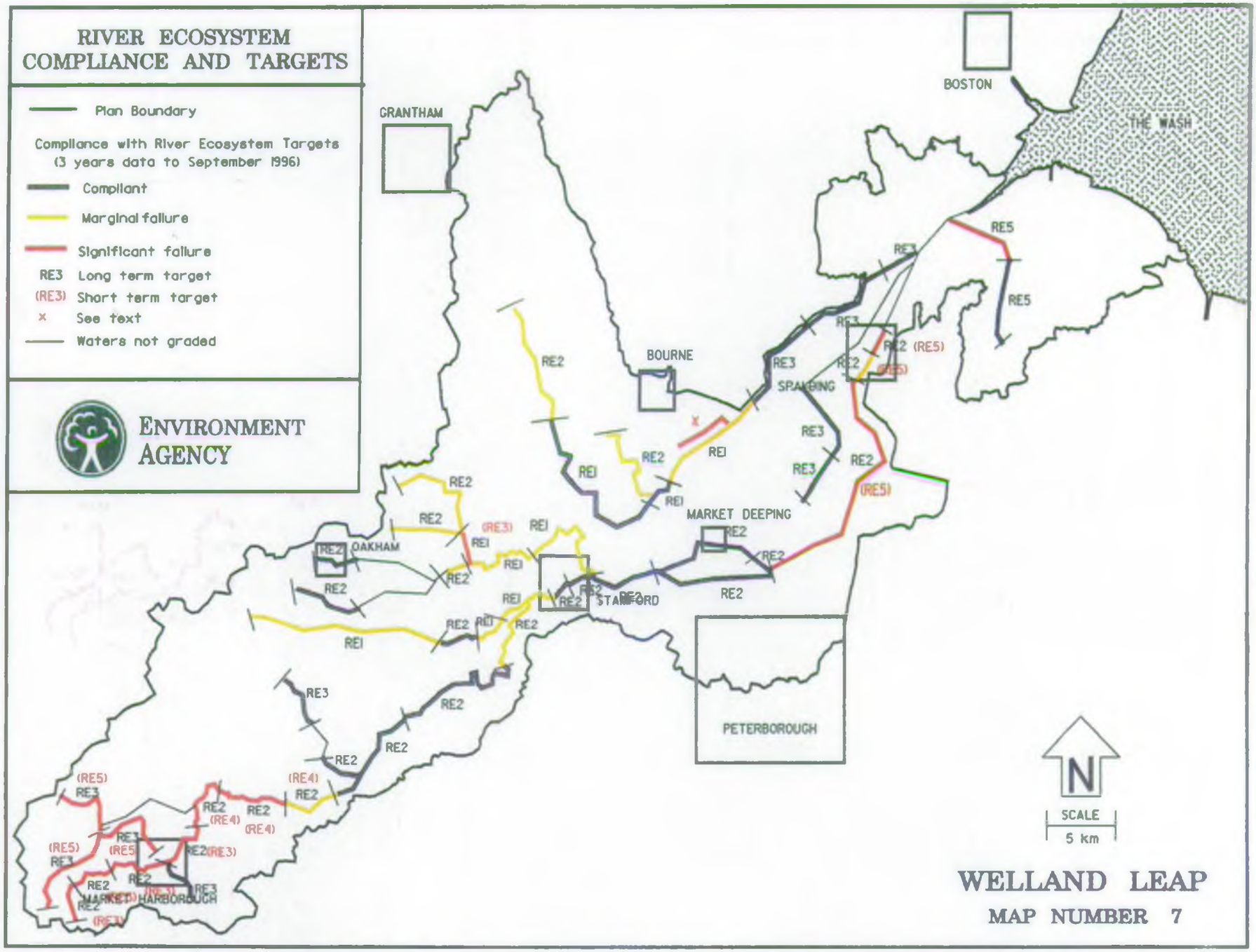
A review of chemical data from the last 15 years demonstrates that these stretches have always failed their Biochemical Oxygen Demand (BOD) and Disolved Oxygen (DO) targets, either marginally or more recently significantly.

These failures are characterised by peaks in BOD in summer and super-saturated dissolved oxygen levels. This indicates the presence of algal blooms due to raised nutrient levels rather than an actual pollution problem.

Despite the failure against chemical targets, water quality remains suitable for its use and biological quality very good.

Map 7 shows the River Ecosystem compliance and targets

Options	Responsibility	Advantages	Disadvantages
Review data & continue routine biological & chemical monitoring.	*Environment Agency.*	*Provides further information on the nature & scale of the problem.*	*No effect on current failure.*
Promote good agricultural practices to reduce diffuse phosphate inputs into watercourses (eg. reductions in fertilizer application rates, the use of buffer zones, etc).	*Environment Agency/ MAFF/NFU/ FWAG ADAS Agricultural community*	*Reduces the level of nutrient originating from diffuse sources.* *Possible long-term reduction in level of eutrophication.*	*May not have desired effect in terms of reducing/eliminating eutrophication.*
Encourage the use of phosphate-free detergents.	*Environment Agency/Detergent manufacturers/ General Public*	*Reduces the level of nutrients in domestic sewage received at STWs.* *Possible long-term reduction in level of eutrophication.*	*May not have desired effect in terms of reducing/eliminating eutrophication.*


RIVER ECOSYSTEM COMPLIANCE AND TARGETS
Plan Boundary
Compliance with River Ecosystem Targets (3 years data to September 1996)
Compliant
Marginal failure
Significant failure
RE3 Long term target
(RE3) Short term target
x See text
Waters not graded
ENVIRONMENT AGENCY
GRANTHAM
BOSTON
THE WASH
BOURNE
SPALDING
MARKET DEEPING
OAKHAM
STAMFORD
PETERBOROUGH
MARKET HARBOROUGH
N
SCALE
5 km
WELLAND LEAP
MAP NUMBER 7

B. R.Welland. Headwaters to Ashley Dyke.

The upper reaches of this stretch have suffered from low flows for several years (drought) resulting in raised BOD concentrations and lowered DO concentrations, and invertebrate communities are already adversely affected. Sibbertoft sewage treatment works also discharges into the headwaters such that during low flow periods the effluent becomes a significant proportion of the total flow.

Further downstream the affects of urban run-off, particularly rainwater washing off from roads and industrial areas in Market Harborough, exacerbate the problem. AWS have identified one surface water outlet in particular, known as the "CO-OP" surface water sewer, as requiring improvement and have included it in their capital improvement programme (see **Appendix 4**).

C. River Chater. (Headwaters to Morcott Brook.)

There were consistent failures for BOD, DO and ammonia in this stretch from 1989 to 1993 and a significant DO failure in early 1996. Up to September 1996, BOD, DO and ammonia have failed marginally. The drought has significantly reduced flows in this river and hence its capacity to dilute the effluent from small village sewage treatment works. It should be noted that the RE1 target is designed to protect very high quality rivers.

Although this water quality shortfall is identified as a marginal failure, due to the high water quality expected on this stretch, the Agency intends to take early action to investigate this failure.

D. North Gwash. downstream of Oakham

There have been intermittent marginal failures tor BOD,DO/Ammonia(once only) in this stretch in recent years (1990 to 1996). Poor quality macroinvertebrate fauna has also been recorded. These affects are thought to be due to surface run-off from Oakham town.

Options	**Responsibility**	**Advantages**	**Disadvantages**
Review data and continue routine biological and chemical monitoring.	*Environment Agency*	*Provides further information on the nature and scale of the problem.*	*No effect on current problem.*
Undertake pollution prevention campaigns to identify inputs.	*Environment Agency*	*Allows a more detailed quantification of the impact.*	*No effect on current problem.*
Require the removal or improvement of inputs.	Discharger	Improved water quality.	Cost.

E. North Brook, (Exton Arm to River Gwash)

Prior to 1993 this stretch complied with its RE1 target. Since then, BOD has failed significantly and DO marginally. The stretch currently complies with RE4.

BOD concentrations recorded since 1993 clearly show the summer peaks, consistent with algal activity. Fort Henry Lakes, through which the North Brook flows, is known to have suffered major algal blooms in recent summers.

Effluent from RAF Cottesmore STW, discharging to the headwaters of this stretch, has become a more significant source of "dilution flow" since the beginning of the drought. Apart from this effluent, the stretch is fed by springs which have reduced considerably during the drought. Consequently, when the water reaches Fort Henry Lakes, nutrient levels are such that algal blooms are encouraged.

In 1996 a major bloom of diatoms (as distinct from 'blue-greens') in the lakes caused the death of 7,000 fish in the Horn-Mill trout farm. This affect was due to irritation of the fish gills and shows the extent to which algal presence can influence water-quality (the trout farm is located 1 km downstream of the lakes).

Biology quality at the bottom end of the stretch (Empingham) remains very good. This supports the view that the local water quality problem is a result of algal activity rather than a pollution source.

Options	Responsibility	Advantages	Disadvantages
Review data & continue routine biological and chemical monitoring.	*Environment Agency*	*Provides further information on the nature & scale of the problem.*	*No effect on current problem.*
Recognise new sampling & flow gauging point upstream of the lakes.	*Environment Agency*	*Would allow the true influence of the lakes on water-quality to be measured.*	*No effect on current problem.*
Install barley straw bails in the lakes for the summer period.	*Environment Agency/Fort Henry Estates*	*May reduce algal activity in the lake & reduce adverse influence downstream.*	*Treats the symptoms rather than the cause (ie. nutrient levels will not be reduced)*

For failures to:

Thurlby Main Drain (elevated ammonia levels) see **Issue 17.**
Welland - Folly River to Spalding (eutrophication) see **Issue 10.**
Whaplode (Holbeach) River (Tinsley to Tidal Welland). This stretch has consistently failed the RE target for BOD since records began (1984) and macroinvertebrates has also been significantly affected. However a major investment programme to improve the quality of effluent was completed by Tinsley in the summer of 1994. The effluent is now of a consistent high quality. River quality both chemical/biological continues to improve. Although not yet fully meeting all required water quality targets, the stretch is well on the way to full recovery.

ISSUE 16

Losses of water from certain stretches of the River Glen are inadequately understood; this impacts upon the effectiveness and operation of the River Gwash to River Glen river transfer scheme.

Background

The Southern Limestone aquifer within this and the adjacent Lower Witham Plan Area is extensively used for public water supply. Under a long standing agreement, abstraction has increased from the aquifer over the last 6 years subject to there being an augmentation scheme available to support flows in the River Glen. This Gwash Gwash-Glen Transfer scheme was commissioned in 1991 to transfer water from Rutland Water via the R. Gwash to the R. Glen downstream of Essendine (see **Map No. 5**). Losses occur from the river channel downstream of the transfer point so that the full flow benefit downstream in the R. Glen is not as great as had been hoped.

A map showing the location of the transfer is included at Issue 1.

Effects

Of the water transferred and discharged to the River Glen, some is lost through the bed of the river. These losses are inadequately understood. Potential environmental benefits to surface waters and the value of the transfer scheme may not be being fully realised, particularly in the lower Glen.

Options	Responsibility	Advantages	Disadvantages
Investigate and evaluate the role of the local geology on losses from the River Glen.	*Environment Agency*	*Improve understanding of where and what losses occur.*	*Cost*
Carry out a thorough hydrological review of the 5/6 years of transfer scheme operation and make recommendations for its future operation.	*Environment Agency*	*Assist in making optimum use of the water available for environmental benefit and water supply.*	*Cost*
Do nothing			Ineffective management of the River Transfer scheme.

ISSUE 17

Baseflows in some watercourses south of Bourne have been reduced by the sealing of 'wild' boreholes which are believed to have impacted on environmental and other uses

Background

The Southern Limestone aquifer within this and the adjacent Lower Witham Plan Area is extensively utilised for public water supply.

Numerous abandoned agricultural and industrial boreholes exist in the area which discharge, uncontrolled, into the surface water drainage system. In the early 90's, work was carried out by our predecessor, the NRA, to control/seal some of these "wild "boreholes to reduce water losses from the aquifer. This resulted in less water being available in the surface water system for dilution, abstraction and ecological benefit purposes. One such area where this work was caried out was Bourne South Fen.

Effects

Since the bores were sealed, the volume of surface water draining through parts of the catchment has been reduced substantially. However, the extent of the environmental impacts that these cappings have had have only become apparent in recent dry winters. Peat soil in this area naturally leach ammonia and iron-ochre during wet weather, and have led to elevated ammonia concentrations and orange discolouration in local watercourses (notably the Thurlby Main Drain) which is impacting onto both conservation and fisheries locally, and to a lesser degree the Glen. Although the ammonia and iron-ochre problem is a naturally occurring feature, clearly this has been exacerbated by the capping and subsequent reduction in dilution. It is not known what sort of impact they had before the boreholes ever existed.

Options	Responsibility	Advantages	Disadvantages
Review the current status of the wild bore discharge (both water resource and env. implications)	Environment Agency	Provide a balanced view on the priorities for water use in the area.	No impact on current problem.
Consider identifying river flow objectives** locally for affected watercourses, to meet identified objectives where justified.	Environment Agency	Identifies the scale of the water-shortage for environmental requirements.	No impact on current problem.
Investigate the impact of reduced flows on the catchment's watercourses.	*Environment Agency*	*Provides better information upon which to base decisions about improvement strategies.*	*Cost.*

**Refer to Section 6.4.3 for definition

ISSUE 18

Land drainage and agricultural practices have significantly reduced habitat diversity within rivers and their flood plains

Background

For most of this century river management across the Region was driven by agricultural policy to improve drainage within the floodplain and hence maximise the production of crops, notably cereals. These activities have resulted in the loss of many in-channel and floodplain habitats and a consequent reduction in floral and faunal diversity. In the Welland catchment for example, the River Welland between Market Harborough and Stamford was dredged and shortened in the late 1960's and early 70's. The bed level of the river and tributaries was lowered by over a metre and important habitat features such as riffles and cliffs disappeared along with large numbers of meanders. At the same time a large number of trees were removed.

Effects

The relationship between water level and the surrounding flood plain has been broken leaving the river to flow in a deep gorge with very few riparian habitats upon which flora and fauna depended for their survival. Plant diversity is now very limited with only a fraction of the number of species present that we might expect.

Options	**Responsibility**	**Advantages**	**Disadvantages**
Carry out a feasibility study to identify specific river/floodplain restoration and habitat enhancements eg. *- during routine Agency work;* *- flood defence capital or maintenance programs,* *- by reviewing management of Agency owned land.* *- capital projects (longer term)*	*Environment Agency* *MAFF*	*Fulfils duties to further conservation.* *Can be achieved with neutral or even beneficial impact on standards of flood defence in the catchment.*	*Cost.*
Encourage landowners to restore habitats and enhance river margins	*Environment Agency* *Landowners* *MAFF/FWAG*		
Do nothing			Continued loss of flora and fauna.

ISSUE 19

The demand for water from the lower Welland exceeds available river flows in dry summers.

Background

The demand for water from the Welland includes that of the public for domestic use, that of the farming fraternity for irrigation purposes, that of industries such as food processing and that of the environment. These competing demands can exceed the quantity available especially during periods of low flow when very often the demand in the Lower Welland for water increases.

During such periods of excess demand, our ablilty to maintain river levels and flows becomes difficult. The lack of flow impacts on flora and fauna, upon water quality in general and the lack of flow to tide has implications for siltation in the tidal Welland.

Major water abstractions occur in parts of the catchment, whereby water is transferred from higher level rivers to meet abstraction needs in lower level watercourses. These transfers, effected by sluices known as "slackers", are not licensed and are outside the regulatory control of the Agency.

Inconsistencies arise between abstractors with more recent licences, which are linked to flow conditions in the main river, and those with historic licences which exert little control.

This is a complicated problem for which we will have to develop both long and short term objectives and strategies if we are to ensure the long term sustainability of water resources (both locally and nationally), and alleviate the pressures created by the immediate shortfall in availability.

Effects

During periods of low flow, a lack of abstraction policy for "slackers" leads to inconsistency, whereby some abstractors are prevented from abstracting whilst others can continue.

15-19-11-10

Options	Responsibility	Advantages	Disadvantages
Achieve operational agreement with abstractors: *- identify ownership, maintenance and operation of slackers;* *- draw up operational guidelines for all slackers;* *- voluntary abstraction restrictions;* *- use of Winter Storage Reservoirs.*	*Environment Agency* *IDB* *Abstractors*	*Improve management of water resources in the area.*	
Seek to control summer licences with stricter control levels/flows or revoke licences.	Environment Agency	As above	
*Press for a national policy and methodology on "slackers" and RFOs.**	*Environment Agency*	*As above*	
Determine RFO for flows to tide on the Welland.	*Environment Agency*	*As above*	
Consider the feasibility of using flows from the Eye Brook to yield additional flows for the lower Welland.	Environment Agency	Makes more water available although likely to be less than potential demand.	Costs and implications for making water available in the lower Welland.
Seek to maintain a higher residual flow downstream of Tinwell intake during the summer.			
Do nothing.			

*River Flow Objectives : For definition see **Section 6.4.3**

ISSUE 20

The use of the Maxey Cut as a fishery and as a source of water for summer irrigation are not sustainable.

Background

The Maxey Cut was constructed as a flood relief channel to take flood flows from the River Welland around Market Deeping. Since it's construction, and despite it's lack of natural flow it has been populated by fish to the extent that it has developed into a spawning and breeding area for coarse fish and brown trout. It is also used by farmers for summer irrigation purposes.

During the last few years the Maxey Cut along with other watercourses in the area has been increasingly affected by low flows. Due to the Cut's permeable gravel bed, levels within the watercourse respond rapidly to changes in the ground water level, and it dries up during drought conditions. This leaves numerous small ponded stretches from which fish have to be rescued. The angling club which leased the water has relinquished it's lease because of low fish stocks and heavy weed growth which make it difficult to fish. The two abstractors licensed to take water for summer spray irrigation from the Maxey Cut are affected by low flows.

This issue is made more complex because it currently receives part of it's flow from water pumped into the Maxey Cut from a former gravel working now restored to agricultural land use. This is an issue in itself as discussed at **Section 4.5** and **Issue P3.**

Effects

There is an impact upon flora and fauna within the system and upon fish in particular. Water resources for spray irrigation purposes become unreliable.

Options	Responsibility	Advantages	Disadvantages
Develop a sustainable strategy for the Maxey Cut.	*Environment Agency*		
Retain higher water levels by the construction of an impounding weir. Create deep water refugesto help fish during periods of low flow.	Environment Agency	Benefits the fishery and abstractors.	Increases flood risk.
Do nothing.			

ISSUE 21

Concern has been raised over local derogation/over commitment of resources within the Southern Limestone aquifer.

Background

The Southern Lincolnshire Limestone aquifer within this area and extending into the adjacent Lower Witham Plan Area is extensively utilised for public water abstraction. Temporary variations in licences were issued to Anglian Water Services Limited in 1990 and these are time limited to the end of 1997. The water company have applied to maintain the current level of abstraction with some redistribution in terms of where the water is taken from, within the aquifer.

Advertisements relative to these licence applications has resulted in several local interested parties raising concerns over the proposals.

To accompany their licence applications as required by the Agency, AWS commissioned a study to assess the potential impacts of abstraction on river flows and associated ecology, groundwater levels and groundwater quality (saline intrusion). The results of this study are currently being assessed by the Agency.

Effects

Although AWS requirements are for no overall increase in current licensed abstraction quantities, the past effects of this level of abstraction need to be reviewed and the proposed changes in abstraction pattern considered to determine whether there are any implications for other abstractors or environmental flows.

Options	Responsibility	Advantages	Disadvantages
Review licence applications, accompanying environmental assessments and objections. Determine applications and issue appropriate licences.	*Environment Agency*	*Balancing needs of abstraction with the needs of the environment.*	
Do nothing			

ISSUE 22

The burning of wastes at cement and lime plants is of national and local concern.

Background

The burning of wastes at cement and lime plants is of national and local interest. The situation at Castle Cements, Ketton is part of this general concern.

The cement and lime industries are attracted to substitute liquid fuels (SLF) and other waste derived fuels, as a source of cheap energy. Nationally, four cement kilns and two lime works have been authorised to burn SLF permanently and other sites are undertaking trials. Applications for the burning of tyres and in one case, X-ray film, have also been received. Where operators apply to burn such fuels, we require the operator to make an application which includes trial protocols and assessments of the likely impact upon the environment. Such applications are subject to statutory and public consultation.

Our position has been that the burning of SLF, of controlled composition, under the emission limits imposed by the Agency, has no net adverse effect on the environment, the human food chain or human health, compared to conventional fuels.

Public concern on this issue has led to the Government taking a close interest in the SLF trials and a House of Commons Select Committee on the Environment has conducted an enquiry into the Environmental Impact of Cement Manufacture. The Committee's findings confirmed that the use of such fuel was of positive benefit to the environment as a whole. It went on to recommend improvements to the way in which we carry out some of our duties.

One such site is present in the Plan area at Ketton near Stamford where a member of the public has responded to the public consultation on burning waste tyres in the cement kiln, raising questions over health effects.

Options	Responsibility	Advantages	Disadvantages
Continue to regulate such processes as part of our Integrated Pollution Control approach toward all emissions.	*Environment Agency*	*Prevents and minimises harmful emissions to the environment.*	
Participate in the government review and public consultation protocols already established.	*Environment Agency*	*Should allay public and govt. concerns regarding the controlled use of SLF andother wastes as fuels.*	

4.0 PROTECTION THROUGH PARTNERSHIP

4.1 Introduction

Using regulatory power set out in legislation, we are able to influence a wide range of activities which impact upon the environment. These may be with respect to discharges to land, air or water and relate to water quality, industrial discharge and water resource concerns. There are however a range of activities such as development and agricultural practices which can potentially impact upon the environment where our powers are not prescriptive. In such instances we rely on working in liaison with others, particularly local authorities, individuals, landowners, businesses and community groups in order to protect and enhance the environment.

4.2 Land Use Planning and LEAPs

Land use is the single most important influence on the environment. Government Planning Guidance highlights the importance of liaison between Local Planning Authorities (LPAs) and the Agency and the relationship between land use and environmental matters.

Control of land use change is primarily the responsibility of LPAs, through implementation of the Town and Country planning acts. Through local development plans, which provide a 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. These decisions can have a profound affect on the environment and it is important that we are able to influence this process. Planning liaison is the link between our functions and local authority planners.

However, whilst the planning system has a significant role in seeking sustainability, it cannot always ensure that an appropriate balance of habitats and features are maintained in the countryside. Many activities which destroy wildlife habitats, such as ploughing meadows and grubbing out woodlands are outside the scope of the planning process. Legislation is proposed which will give protection to ancient hedgerows.

The Environment Agency's participation in the Town and Country planning process is essentially at two levels:

(i) On a day to day basis we act as a consultee in certain types of planning application. We liaise and advise on proposals which may impact on matters relevant to the Agency. This allows our views to be considered by the Council prior to a planning application being decided.

(ii) In the long term, policy and strategy for change in land use is contained in the development plans and other plans prepared by LPAs. Development plans are particularly important because they set the framework for development into the future and are the key to the determination of planning applications.

4.3 Local Agenda 21

Since the UN Earth Summit in June 1992, local authorities have been considering production of their own Local Agenda 21 programmes, which will encourage wider access to environmental information, greater community participation in decision making and the adoption of sustainable development principles. Local Agenda 21 promotes the concept of thinking globally, acting locally.

The Environment Agency has been working with Lincolnshire County Council on the preparation of its State of the Environment Report and now plays an active part on Environment Forums for both Lincolnshire and Northamptonshire. We have also commented on Strategies such as the Peterborough Environmental Audit. We will continue to assist authorities in this area.

4.4 Planning Guidance

The NRA produced a set of statements in its document "Guidance Notes for Local Planning Authorities on the Methods of Protecting the Water Environment through Development Plans". These statements provide a general guide to LPAs on what policies should be included and why they are important. This guidance will be updated soon by us to incorporate air and waste issues.

4.5 Planning Issues

The planning system generally and the use of planning conditions in particular, must not duplicate the controls imposed by pollution control bodies. These include the Environment Agency and local authorities in their non planning functions. Clarification on this matter is provided in Planning Policy Guidance Note 23.

There are a number of important planning issues of concern within the Plan area which will be addressed and resolved through the adoption of a productive partnership approach between ourselves and LPAs in particular. These are identified below and include guidance which we would like to see adopted by LPAs in the preparation of development plans and in the assessment of planning applications. Attention will be drawn to these statements through our planning liaison work.

P1: Protection of groundwater resources
P2: Surface water run-off from development
P3: Low level restoration to agriculture

Issue P1 Protection of groundwater resources

The issue

Groundwater resources are very important and are a major source of high quality public water supply. Both the quantity and quality of groundwater resources must be protected to ensure that future generations continue to benefit from this essential resource.

Groundwater resources require special protection from pollution, since once contaminated it is often difficult to restore the resource. To ensure sustainable provision of water resources the precautionary principle should be adopted to avoid unacceptable risk of pollution.

Guidance

Development should not normally be permitted which in the opinion of the LPA, after consultation with the Agency, poses an unacceptable risk of pollution of groundwater resources. Where development is permitted in areas where the groundwater is vulnerable, the LPA should ensure that appropriate pollution control measures are included to prevent an unacceptable risk of pollution of the water resource.

The vulnerability of the aquifer to pollution depends upon many factors, such as the overlying geology and the presence of boreholes. We have mapped the vulnerability of aquifers and identified areas where special protection is required. New maps for groundwater protection have recently been compiled of the Anglian Region, which is acting as a pilot region for their compilation and use. The areas on the new groundwater protection maps are non-statutory, and represent areas where groundwaters are at varying degrees of risk from potentially polluting activities and developments. Maps identifying Groundwater Protection Areas have been circulated to all planning authorities.

Issue P2 Surface water run-off from development

The issue

Inappropriate development within the plan area can pose a risk to the environment. Piecemeal development relating to the discharge of surface water to watercourses, can over time lead to serious problems, because the appropriate infrastructures have not been developed accordingly. This is a potential issue throughout the Plan area, but is currently of particular concern in the following areas:

P2(A) Barleythorpe Brook

Barleythorpe Brook is a non-main river tributary of the River Gwash draining the northern part of Oakham. There have been flooding problems in the past and some localised improvements have been carried out to accommodate recent residential development.

The current Local Plan for the area has identified additional residential and industrial/commercial development to the north of the town, alongside the proposed by-pass, which will add to the problem.

Ideally an overall strategic approach would be preferable to piecemeal solutions for individual development sites as these could have potential future maintenance problems. At Barleythorpe Brook (which is a private watercourse subject to riparian responsibility), this has resulted in proposed watercourse improvements to mitigate the effect of housing

adjacent to the by-pass. Other areas of development identified in the Local Plan will be subject to further investigation and/or improvement works.

P2(B) Bourne Catchment

The Bourne catchment is drained by the Bourne Eau, Car Dyke North and South Arms and their tributaries.

Bourne Eau is in turn a tributary of the River Glen which it joins to the west of Tongue End. Under low flow conditions, discharge is by gravity but when the level in the Glen is above that in the Bourne Eau, discharge is via an Agency owned and operated pumping station.

There are various ongoing and planned housing and industrial development projects in Bourne and Thurlby and because of the absence of data relating to the precise catchment area and the current capacity of the drainage system there is no way of determining the effects of these developments. The lack of knowledge as to the catchment extent and capacity prevents the formulation of a strategy to deal with run-off from new development.

The system is assumed to be at capacity and therefore new developments are perhaps being unnecessarily constrained by the requirement to provide flow balancing facilities with the consequent problems these bring in terms of ensuring future maintenance to designed standard. If the system is in fact capable of dealing with unattenuated flows then this would be a more efficient management of flood defence.

A study is required which will increase our knowledge and ability to develop a long term strategy for this catchment.

Guidance

The LPA should resist development which would result in an adverse impact on the environment due to additional surface water run-off. Development which could increase the risk of flooding must include appropriate alleviation measures, defined by the LPA in consultation with ourselves. We will encourage LPAs to adopt a strategic approach and fund infrastructure costs themselves or require developers to fund costs. This will include the costs of long term monitoring and management.

However, no one public body has the necessary powers to ensure piecemeal development does not take place, particularly where there are a number of individual sites and/or developers. Surface water drainage remains the responsibility of a combination of riparian, IDB, local council, water company and the Environment Agency.

The Agency's flood defence policies in relation to development within floodplains is set out in our document "Policy and Practice for the Protection of Floodplains, 1997". These policies are

aimed particularly at LPAs, but also developers, environmental interests and members of the public.

To assist local authorities in floodplain land use planning, the Agency is in the process of producing up to date and consistent maps of floodplains as part of our survey duties under Section 105 of the Water Resources Act 1991.

Issue P3 Low level restoration to agriculture

The issue

We are concerned with the restoration of sites, formerly used for mineral extraction, to low level agriculture. By low level agriculture we mean that land is returned to agricultural use at a level below its original height (effectively in a depression in the ground). Such restoration normally only occurs where the water table is sufficiently low to not be affected, or exceptionally where the water table is higher if the site can be sealed to prevent the movement of water into the site. In some cases permanent dewatering may have to be operated to prevent the restored area from flooding. This does not accord with the principles of sustainable development and in some cases has resulted in reducing local groundwater levels.

Groundwater levels have been affected as a consequence of the dewatering of such sites in the Plan area, including the Tarmac site at Maxey Cut and the Redland site at Stowe Farm. The situation is complicated at certain sites, such as the Maxey Cut, where pumped water can benefit the environment at times of low flow.

Guidance

We will:

(i) liaise closely with planning authorities on such matters;
(ii) encourage local planning authorities to look favourably at options for restoration to open water, or fill with clean inert waste, in preference to restoration to low level agriculture;
(iii) seek the inclusion of planning restrictions in Development Plans where appropriate.

4.6 Other issues for Partnership

There are a number of other important issues which will be addressed and resolved through the adoption of partnership initiatives between ourselves, local authorities and other interested organisations and individuals. These are identified below and it should be noted that these will be taken forward with the same emphasis and commitment as other issues identified elsewhere in the Plan:

P4 Sustainable waste management
P5 Illegal disposal of waste
P6 Land use management and soil erosion
P7 The threat to biodiversity

P8 Sustainable use of water
P9 Recreational use of the water environment

Issue P4 Sustainable Waste Management

Sustainable waste practices are an important part of an overall sustainable development strategy for the country.

Whilst waste production cannot be totally eliminated, much could be done to make waste production and management practices more sustainable, by considering and applying options in the waste management hierarchy of: reduction - re-use - recovery - disposal. The objectives are to reduce the quantity of society's waste, make the best use of it and to minimise its risks to the environment and human health now and in the future.

The Agency will, in partnership with others:

(i) promote and implement waste reduction and minimisation processes;
(ii) encourage waste recovery techniques such as recycling, composting and energy production;
(iii) improve awareness of waste recycling/minimisation opportunities by publicity and education.

Issue P5 Illegal disposal of waste

The disposal of waste on unlicensed sites or in contravention with waste management licence conditions may cause pollution to the environment, harm to human health and serious detriment to local amenities. This includes the irresponsible disposal of litter and household waste, waste operators not complying with their licence conditions and commercial operators who deliberately dispose of waste. Part of the problem stems from the lack of awareness by those involved of the nature and extent of current waste management legislation.

We will continue enforcement activities and, in partnership with others such as local schools:

(i) improve awareness by publicity and education;
(ii) encourage people to report incidents of illegal waste disposal through the promotion of our environmental emergency Hotline on 0800 80 70 60.

Issue P6 Land use management and soil erosion

Modern agricultural land use practices such as the removal of hedgerows can result in an increase in soil erosion. These, in turn, can result in an increase in sediment load to watercourses.

Changes in the natural input of sediment into watercourses can have significant effects on stream habitats and may result in drainage problems and harm to wildlife. Sediments can also carry chemical pollutants such as pesticides or nutrients. Sources of sediment from agriculture can either be from the land or river banks. High inputs of sediment occur following severe soil

erosion either caused by uniform sheet erosion, or where flow collects in rills and gullies. Risk of erosion is greatest on vulnerable soils (such as sandy and chalky soils) with steep slopes.

Changes in land management are important for tackling this issue. One technique for reducing diffuse pollution from agriculture lies in the use of buffer strips. These are generally a vegetated strip of land alongside a watercourse that is managed separately from the rest of a field. They reduce pollution by distancing agriculture from a riparian area, thus reducing direct pollution (eg. spray drift) and by intercepting run-off and soil movement from agricultural land. Guidance on buffer strips and their implementation is given in the Agency's publication "Understanding Buffer Strips - An Information Booklet".

We will:

(i) encourage the use of buffer strips to reduce land run-off and soil erosion.

Issue P7 Threats to Biodiversity

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.

To date, in the Plan area, Local Biodiversity Strategies have been prepared by the Wildlife Trusts for Lincolnshire, Northamptonshire and Leicester and are due to be prepared for the remaining areas in the near future.

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:

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

Issue P8 Sustainable use of water

As a generalisation, during summer months, the demand for water by farmers for spray irrigation occurs when there is least water available naturally. This is true both of those who are dependent upon the groundwaters of the Lincolnshire Limestone, and of those wishing to make use of surface waters.

Our licensing policy for the limestone aquifer states that no abstraction licences should be issued for additional groundwater abstraction. Within the Welland catchment additional surface water may be available by abstraction of winter water for storage and subsequent summer use (subject to conditions).

To address this shortfall the Agency encourages farmers to consider the construction of winter storage reservoirs. The Agency offer a financial incentive to farmers to take winter water by charging it at a rate of 10% of the summer water abstraction rate.

Issue P9 Recreational use of the Water Environment

We recognise that the potential recreational value of the water environment is not fulfilled in this area, and are keen to support initiatives such as the development of a Welland Way. This proposed walk would run from the upper reaches of the river above Market Harborough down to the tidal waters at Fosdyke bridge, taking in some of the places of interest en route.

The development of disabled fishing platforms offers some scope towards extending facilities for a greater range of the recreational public. A site on the outskirts of Spalding has already been identified. Two such platforms have already been constructed on the Welland in Stamford. These have been supported by the local community and are very successful. Other opportunities exist for the establishment of canoe launch sites, bird watching hides, gates for disabled access and possibly picnic areas.

We do, however have to balance these interest against others and have a duty to take into account the interests of flood defence, water quality and conservation, which can all suffer as a consequence of such recreational schemes.

PART II

5.0 USES, ACTIVITIES AND PRESSURES

Uses - Contents	
5.1	Development and Infrastructure
5.2	Agriculture and Forestry
5.3	Industry
5.4	Waste Water Disposal
5.5	Waste Management
5.6	Mineral Extraction
5.7	The use of water - Abstraction
5.8	Land Drainage and Flood Defence
5.9	Landscape & Heritage
5.10	The Natural Environment
5.11	Fisheries
5.12	Recreation & Amenity
5.13	Radioactive Substances

The purpose of this section is to identify and summarise the uses, activities and pressures in the Plan area which exert an influence upon the wider environment. This information consolidates the Agency's understanding of the Plan area against which it will consider its future actions.

The information presented in this section is limited to those activities and pressures upon which the Agency has direct or indirect influence or responsibility.

5.1 DEVELOPMENT AND INFRASTRUCTURE

5.1.1 General

The continual development of our cities, towns and countryside, and in particular the urbanisation of greenfield sites has the single most significant influence on the environment. Development may include new building works, changes in land use, development of communications and the construction of new roads, sewers and other services.

Development can result in:

(i) an increased risk and occurrence of flooding as a consequence of changes to surface water drainage and development in the flood plain;
(ii) an increased risk to water quality:
  (a) from effluent discharges to surface water and groundwaters,
  (b) from increased pressure upon the sewerage infrastructure;
(iii) an increased demand for water for industrial use, and for public water supply;
(iv) a risk to flora and habitats;
(v) an increase in the volume of waste produced.

5.1.2 Local Perspective

The large majority of the population in the Plan area live in the larger market towns of Spalding, Stamford, Oakham, Market Harborough, Uppingham and Bourne and in the newer settlements in and around the edge of Peterborough. The towns provide the focus for employment, commerce, retailing, recreation and culture. They are also the main sources of existing investment in infrastructure provision and buildings. The economy of the Plan area is largely based upon agriculture, and related industries such as engineering, which provide the major source of employment along with retailing and other service trades.

5.1.3 Planning context

Detailed objectives for future development are set out by each planning authority in their respective development plans. Regional Planning Guidance issued by central government, and giving these plans a common basis, is currently under review. New guidance will reflect a shift in emphasis towards the need for sustainable development and identify the availability of water resources, sewage infrastructure, flood risk and protection of the environment as key factors which may limit development and which should be considered during the writing of development plans.

Each of the LPAs in the Plan area have produced local development plans on which we are consulted. The current state of the plans for the Councils in the Plan area is shown in Table 1.

Table 1: Status of development plans

PLANNING AUTHORITY	DEVELOPMENT PLAN	STATUS
Lincolnshire County Council	Lincolnshire Structure Plan	Structure Plan Consultation, May '96
Northamptonshire County Council	Northamptonshire Structure Plan	Structure Plan Consultation due '97
Boston Borough Council	Boston Local Plan	Deposit Draft, June '95. Public Inquiry October '96
Corby District Council	Corby Local Plan	Deposit Draft, 1993. Adopted May '97
Daventry District Council	Daventry Local Plan	Deposit Draft, '93. Adopted May '97
East Northamptonshire District Council	East Northamptonshire Local Plan	Deposit Draft '93. Adopted Nov '96
Harborough District Council	Harborough District Local Plan	Deposit Draft, June '95
Kettering Borough Council	Kettering Local Plan	Adopted, January '95
Peterborough City Council	Peterborough City Local Plan	Adopted October '96
Rutland District Council	Rutland Local Plan	Deposit Version, August 1996
South Holland District Council	South Holland Local Plan	Deposit Draft, September '95. Public Inquiry, September '96
South Kesteven District Council	South Kesteven Local Plan	Adopted April 1995

We are also a statutory consultee under planning legislation and advise County and local authorities on development proposals which may have an effect on matters relevant to our interests. The Agency's purpose in this participation is the protection of the water environment and the prevention or mitigation of any adverse effects associated with development and land use change. It must be remembered however that the final decision on planning matters rests with the planning authorities.

A key objective of the LEAP process is to provide the LPAs with a clear picture of the Agency's responsibilities and policies toward development of the catchment.

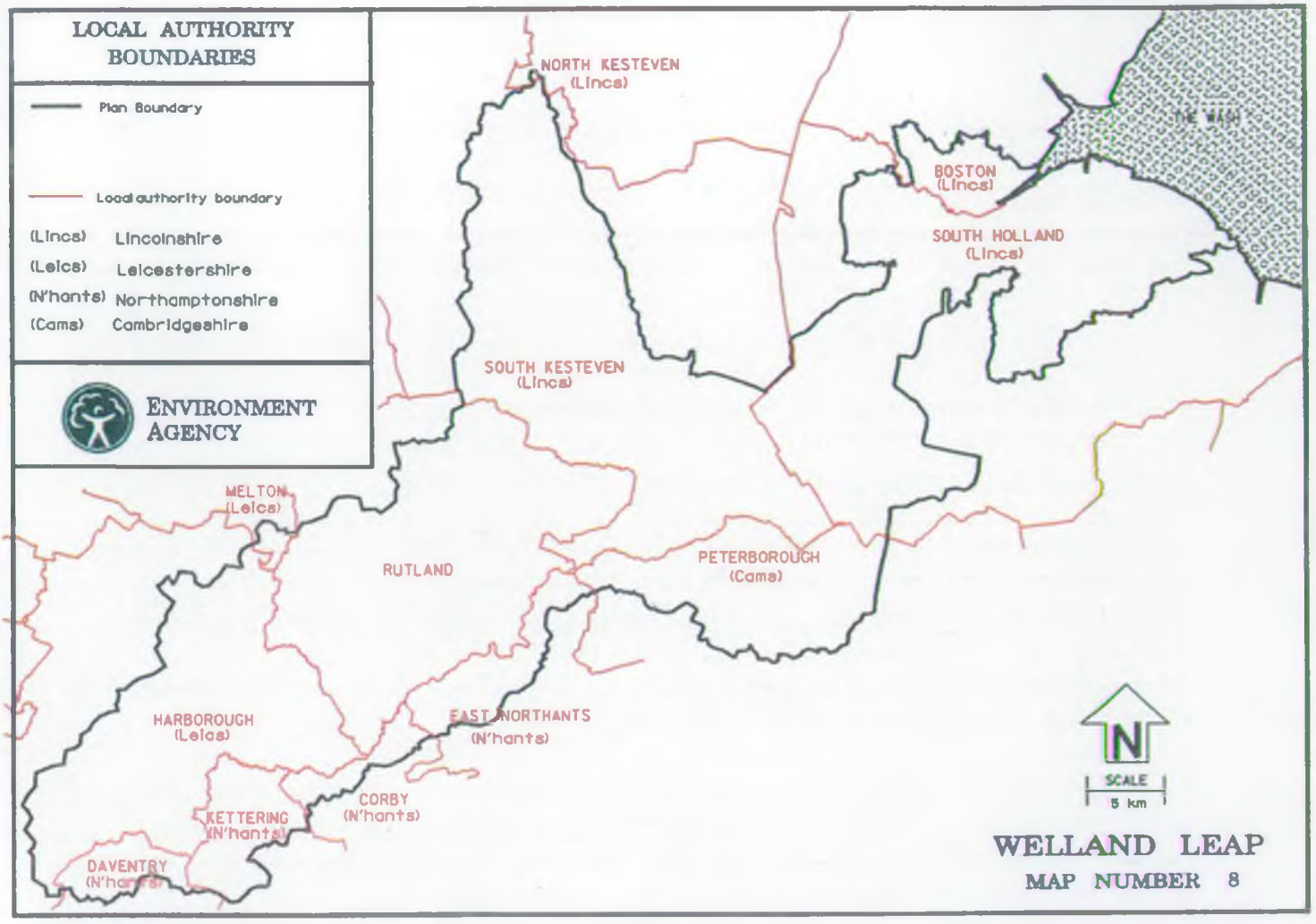
Table 2 shows population predictions for parishes of more than 3,000 inhabitants based on an Agency database.

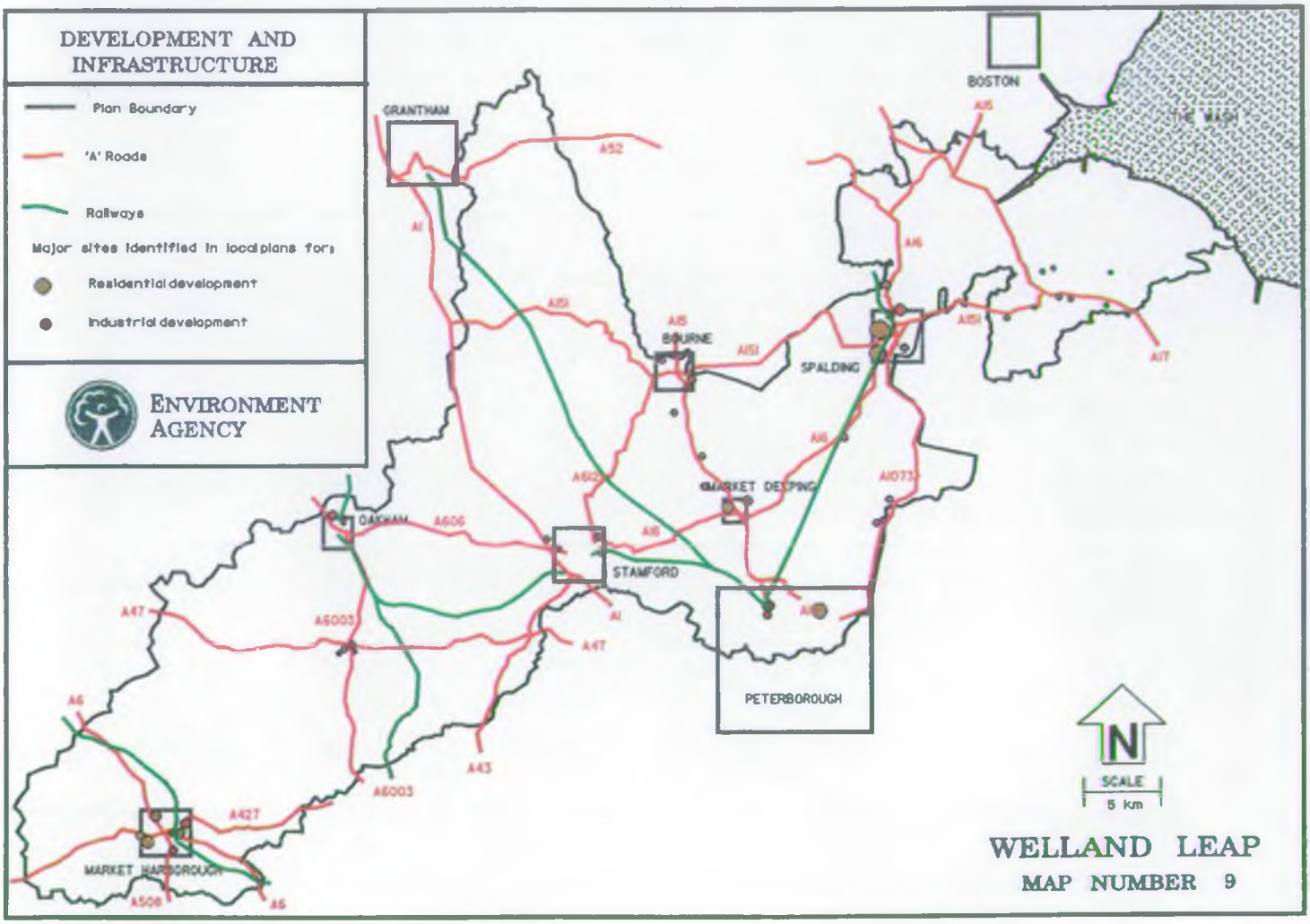
Table 2: Predicted changes in population in the Plan area

PARISH	POP. '1993	POP. (EST.) 2001	POP. (EST.) 2006	% GROWTH 1993 - 2006
Bourne	10,588	12,801	13,096	19%
Crowland	3,609	4,222	4,319	16%
Deeping St. James	6,538	6,671	6,824	4%
Desborough	7,487	7,683	7,927	6%
Holbeach	8,203	8,581	8,778	7%
Kibworth Beauchamp	3,626	3,844	3,932	8%
Market Deeping	5,528	6,445	6,593	16%
Market Harborough	17,069	17,649	18,101	6%
Oakham	9,465	Not available	Not available	
Pinchbeck	5,186	5,509	5,635	8%
Spalding	21,111	23,928	24,490	14%
Stamford	18,627	19,735	20,189	8%

The Lincolnshire Structure Plan proposes a number of 'defined towns' where the largest proportion of new development is to be directed. In the Plan area, these 'defined towns' include Stamford, Market Deeping, Bourne, Holbeach, Spalding and Crowland. Outside Lincolnshire, the main areas for future development include Market Harborough, Oakham, Uppingham and the northern part of Peterborough. Areas of new industrial development, including warehousing, retailing and office development are proposed, mainly on the edges of these towns. In addition some development, particularly housing will occur in settlements and villages which have a significant level of facilities, employment and infrastructure services.

Map nos. 8 & 9 show the local authority areas, infrastructure and key development sites within the Plan area.


LOCAL AUTHORITY BOUNDARIES
Plan Boundary
Local authority boundary
(Lincs) Lincolnshire
(Leics) Leicestershire
(N'hants) Northamptonshire
(Cams) Cambridgeshire
ENVIRONMENT AGENCY
NORTH KESTEVEN (Lincs)
BOSTON (Lincs)
THE WASH
SOUTH HOLLAND (Lincs)
SOUTH KESTEVEN (Lincs)
MELTON (Leics)
RUTLAND
PETERBOROUGH (Cams)
HARBOROUGH (Leics)
EAST NORTHANTS (N'hants)
KETTERING (N'hants)
CORBY (N'hants)
DAVENTRY (N'hants)
N
SCALE
5 km
WELLAND LEAP
MAP NUMBER 8


DEVELOPMENT AND INFRASTRUCTURE
Plan Boundary
'A' Roads
Railways
Major sites identified in local plans for:
Residential development
Industrial development
ENVIRONMENT AGENCY
BOSTON
THE WASH
GRANTHAM
A52
A1
A15
A6
A151
BOURNE
SPALDING
A17
A16
A1073
A605
OAKHAM
A606
STAMFORD
A47
A6003
A43
PETERBOROUGH
A6
A427
MARKET HARBOROUGH
A508
N
SCALE
5 km
WELLAND LEAP
MAP NUMBER 9

5.1.4 Transport

Regional transport policies have been revised in the light of important developments in Government policy guidance which have highlighted the contribution of traffic to air pollution and global warming. Policies try to encourage greater use of public transport, walking and cycling facilities, whilst taking measures to manage traffic such that unnecessary traffic is removed from towns and villages, and routes best suited to relieve congestion are improved.

However, car ownership continues to widen due to its benefits to personal freedom and the speed and flexibility that motoring brings to business travel. This is deemed vital to the economy and therefore, appropriate provision for private road travel is recognised as being important.

There is great public concern about the environmental effects of traffic which has led to calls for more demand management and the promotion of public transport, particularly in the towns and cities, but also for more town and village bypasses. These effects include the emission of airborne pollutants including carbon monoxide, oxides of nitrogen, particulate matter, lead and other compounds. Watercourses are also directly affected as a consequence of contaminated surface water runoff from roads and motorways.

Restrictions on public expenditure has meant the establishment of strict priorities for transport spending and the implementation of policies which use the existing road system to the fullest possible extent rather than constructing new roads and at the same time prevent unnecessary growth in traffic.

A number of major road schemes are proposed for the Plan area, including the following: A1(M) Stamford-Newark; A16 Market Deeping/Deeping St. James By-pass; A43/A16 Stamford Relief Road; Oakham By-Pass; A151 Weston By-Pass; and the A1073 Road Improvements.

5.2 AGRICULTURE AND FORESTRY

5.2.1 Agriculture

5.2.1.1 General

Agriculture is the predominant economic activity and land use in Eastern England. The highly productive potential of the land is often maximised by the use of intensive farming practises which can have detrimental effects on water quality, impact on water resources and effect the wider environment:

- the use of fertilisers influences surface water quality, enriches it with nutrients and encourages its eutrophic state. This can also impact on land drainage by increasing weed growth and on groundwater quality by increasing nitrate levels;

- there is a pollution potential to surface and ground waters from pesticides and other farm related effluents;

- the abstraction of water for irrigation affects water levels;

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

- soil erosion can impact both on water and air quality - by adding to the silt and nutrient load of watercourses and airborne particulate matter.

Agricultural pollution sources are varied. They include point sources such as those relating to inadequate oil storage, unsatisfactory slurry storage systems and drainage from silage clamps, to the diffuse pollution deriving from the widespread application of fertilisers. The disposal of wastes to land can have benefits where it acts as a soil conditioner and/or fertiliser. The DoE are proposing to designate certain agricultural wastes as controlled; this will bring them into the same control system as for household, industrial and commercial wastes (see **Section 5.5**).

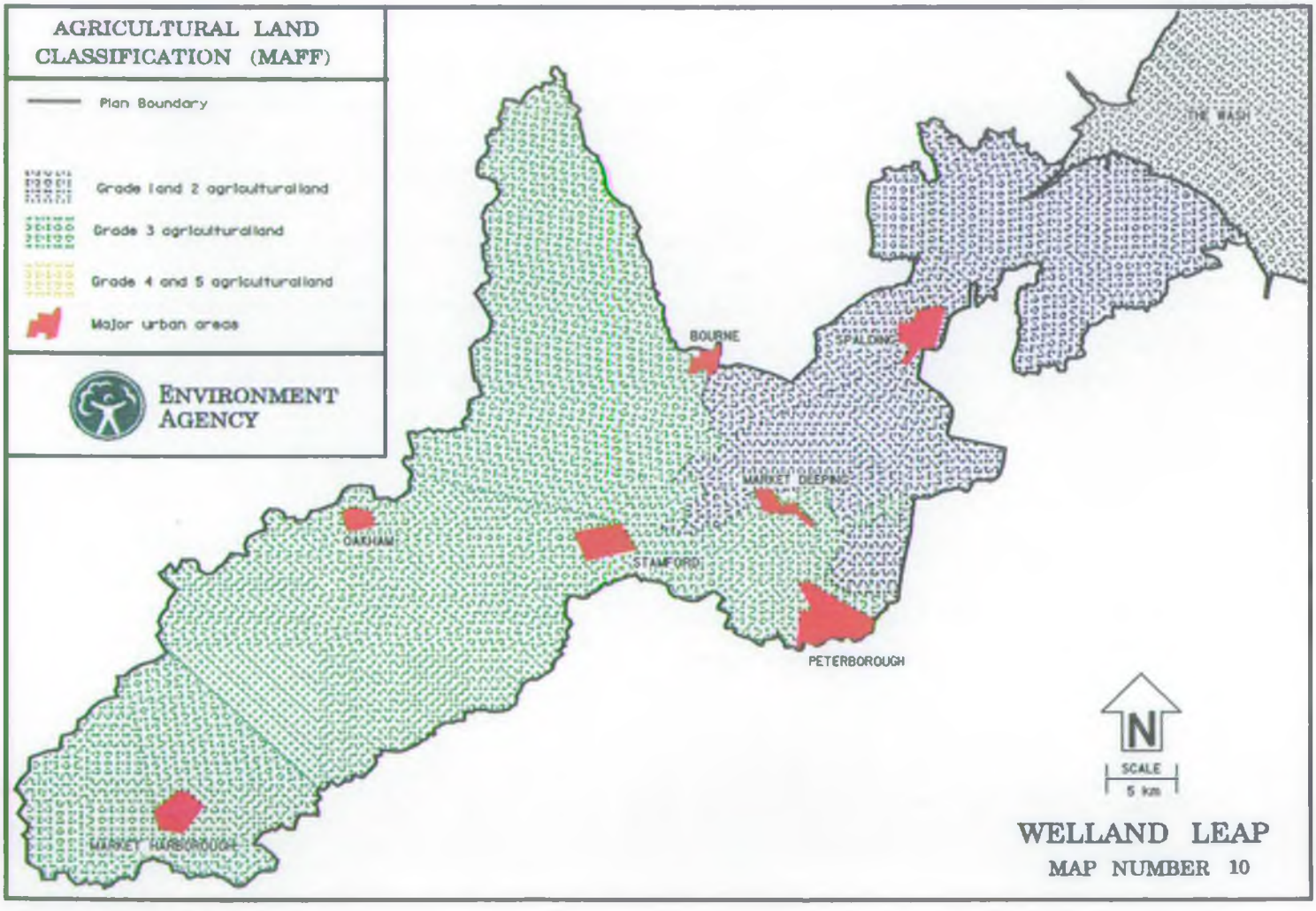
The Ministry of Agriculture, Fisheries and Food (MAFF) classifies land by grade according to the extent to which its physical or chemical characteristics impose long term limitations on agricultural use. These limitations affect flexibility of cropping, level of yield, the consistency of yield or the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

Grades 1, 2 and 3a agricultural land is described as the best and most versatile agricultural land in Planning Policy Guidance Note 7. Such land is recognised in land use planning terms as a national resource for the future, having a special importance.

5.2.1.2 Local Perspective

As indicated on the map opposite, this area can boast a high proportion of better quality agricultural land. Over much of the area, but particularly in the east, the high productive potential of the land is in part realised as a result of the installation of a comprehensive network of pumped and gravity fed land drainage and field drainage systems.

The Plan Area has a total of 175,593 hectares in agricultural use, distributed among 2,197 agricultural holdings, the majority of which are 100 hectares or over in size. Arable and fallow crops (wheat, barley, oilseed rape, field beans, root and horticultural crops) account for nearly 68% of the agricultural land, although this represents a 14% reduction on the area of such crops grown 10 years ago. This decrease is largely attributable to the Common Agricultural Policy (CAP) reform measures introduced in 1992 and in particular the Arable Area Payments Scheme (AAPS), under which all but the smallest holdings which intends to grow cereals, oilseeds, proteins and linseed crops are required to 'set-aside' land. The scheme contains requirements for management of the land during set-aside, and in particular, farmers are encouraged to manage the land in an environmentally beneficial way. In 1996 set aside land accounted for 9% of the total agricultural area.



Grassland, including rough grazing, has also declined in extent over the last ten years. Total numbers of cattle and calves have decreased by 22%, although the beef herd has increased. The numbers of sheep in the area have increased, whilst the pig herd has decreased, both by 12%. Of particular significance has been the huge increase in poultry flocks within the area (a rise of 1,230% in breeding flock).

The Welland valley

5.2.2 Forestry

5.2.2.1 General

Well managed forestry can often bring significant benefits to the environment. Once established, new woodland and even individual trees can significantly enhance the landscape. This may be particularly important in areas where there has been a recent loss of tree cover. However, in certain circumstances, forestry development and management can cause problems, including potential soil erosion, pollution, increased flooding risks and damage to wildlife habitats.

5.2.2.2 Local Perspective

Areas of forestry and woodland in the Plan area are concentrated in the western part of the Plan area, with scattered, predominantly mixed deciduous woodlands covering an area from Uppingham and Oakham through Stamford and north towards Grantham. In contrast, woodland cover is extremely sparse in the east of the Plan area, around the Fens.

New planting is occurring in places with a proportion of existing mixed woodlands undergoing some replanting, mainly with conifers. Until recently, the creation of woodlands has been primarily in the uplands, although in future, more are likely to be established in lowland areas. Part of the Plan area (to the south west of Stamford) falls within an area known as Rockingham Forest. It is intended that woodland cover will be expanded in this area, as part of the Rockingham Forest Project.

5.2.2.3 Role of Key Players

The Ministry of Agriculture Fisheries and Food (MAFF) plays the leading role in the regulation of the agriculture industry. It comments on statutory development plans including those affecting coastal areas, and also on a range of non-statutory plans and strategies. MAFF is a statutory consultee on development involving significant areas of best and most versatile agricultural land, and is also consulted on the agricultural restoration and aftercare of minerals and waste sites.

MAFF provides farmers with free and confidential advice on pollution prevention which is available from ADAS. Farmers are also encouraged to follow advice published in the Codes of Good Agricultural Practice for the Protection of Water, Air and Soil. These set out, along with other advice, guidelines for dealing with the disposal of agricultural effluents from silage and intensive rearing of livestock. These guidelines should also be used in areas of arable farming where careful timing in the application of nitrates and pesticides is important.

MAFF have played a role in the designation of Nitrate Vulnerable Zones (NVZs), areas of land which will in due course be subject to mandatory controls regarding agricultural inputs of fertilisers etc.

Our role in respect of agriculture is equally wide ranging and includes:

- the prevention of pollution to surface water, which we accomplish by the investigation of pollution incidents and by providing advice to farmers about potential pollution sources;

- the protection of groundwater quality by the promotion of water protection zones such as Nitrate Sensitive Areas;

- the regulation of waste matters being spread onto land;

- the licensing of schemes which might impact upon land drainage.

5.3 INDUSTRY

5.3.1 General

Industrial activity can impact upon the environment in many different ways not least because of the waste products they generate. The disposal of industrial waste may be to land, air or water

- Disposal of waste to land includes not only that to landfill sites but also disposal direct to the land where it can be used as fertiliser or as a soil conditioner for environmental benefit;

- Discharges to water are usually via the foul water sewerage network where it is treated prior to discharge into receiving watercourses, but may be via the operators own treatment plants;

- Discharges to the atmosphere take place from chimneys or vents. The impact of industrial emissions to the atmosphere are more far reaching than those to water and to land insofar that our local air quality can be influenced by releases occurring outside the plan area, that is both nationally and internationally.

5.3.2 Local Perspective

With the exception of one cement processing works operated by Castle Cement at Ketton and a lead works in Market Harborough operated by Tungstone Batteries, there is little "heavy" industrial activity in the area. Around Spalding, food processing factories are operated by Christian Salversons and Geests; and in Market Harborough "light" industry includes engineering and plastics.

Our role in the management of water resources can significantly impact upon industry. Recent proposals to use water as the primary cooling agent for a new power station in Spalding have been influenced by our advice that its use in this respect was not sustainable and the proposed station has now been authorised to use air cooling. We have now issued an IPC authorisation to Spalding Energy for the construction of a new gas fired, combined cycle, gas turbine power generation plant. It is anticipated this will take two years before it is commissioned.

5.3.3 The Role of Key Players

Our role in the regulation of industrial discharges is multi - faceted.

Industrial emissions to the environment are regulated, principally by operating a system called Integrated Pollution Control (IPC) for certain industrial processes under the Environment Protection Act 1990. These include large combustion plant, iron and steel making, mineral industries, the chemical industry, solvent recovery and incineration plants (Part A processes). Conditions set out in IPC Authorisations place a requirement on site operators to manage, supervise and control their own sites and the process they operate, to monitor their releases, to

measure their performance against defined parameters and to report to the Agency. The Authorisations themselves set the conditions and release limits with which industrial processes must comply under normal operating conditions. (These cover all emissions to the environment to the land, water and air).
Industrial discharges to water outside IPC legislation are regulated by the issue and enforcement of Permissions (Discharge Consents and Waste Management Licences).

We offer advice on the availability or otherwise of water for industrial purpose.

The Environmental Health Departments of District Councils regulate air pollution from industrial premises under Part I of the Environmental Protection Act 1990. These are premises with generally a lesser potential to pollute than those we regulate, for example paint spraying, small foundries and small combustion plant. The processes concerned are known as Part B processes and only the releases to the air are controlled under this Act.

The Agency has wide powers, but will need to work closely with others if environmental improvements are to be achieved. We will need to look at partnerships with national and local government, business, industry, and environmental and conservation groups to maximise our influence in securing environmental improvements. This is particularly important with regard to local air quality, where we must have regard to government strategy and provide advice to the Secretary of State.

Castle Cement at Ketton

5.4 WASTE WATER DISPOSAL

5.4.1 General

Watercourses are "used" by man to dilute and dispose of liquid waste products. These effluents are principally treated sewage and industrial discharges which have been previously treated to reduce their toxicity to the environment.

Under particular conditions, discharges of untreated effluent also occur. Untreated effluent sources include those discharges from consented emergency and storm water overflows from sewerage systems.

Discharges of surface water from urban and industrial areas and from accidental spillages deriving from a range of domestic, commercial, agricultural and industrial activities cause a significant proportion of the number of pollution incidents. These can cause extreme damage to the environment.

In rural areas many properties are not served by public utility Sewage Treatment Works (STW). In such areas properties make use of small, private STWs and septic tanks, which discharge to land and/or a watercourse and can impact on ground and surface water quality. Some properties rely on Cesspits for sewage disposal, the waste from which is either taken to STWs or spread onto land as fertiliser/soil conditioner. The Agency does not allow discharges from septic tanks to be made direct to watercourses, since they provide insufficient treatment prior to discharge.

5.4.2 Local Perspective

Sewage Effluent

There are 81 Anglian Water Services sewage treatment works in the Plan area. These account for the vast majority of all the effluent discharged to the river. Three of these works treat the sewage produced by populations greater than 10,000 people. These are Market Harborough, Stamford, Spalding, Bourne and Oakham.

Some untreated sewage effluent enters our river systems from consented emergency and storm water overflows from sewerage systems due to the occasional failure of pumping systems or when heavy rainfall overloads the capacity of the sewerage infrastructure.

During summer months the flow generated from sewage treatment works can form a significant proportion of the flow within watercourses.

Seventy eight sewage treatment works are operated by private owners. These include householders, Councils and commercial businesses. Septic Tanks are widely used in the Plan area, however their suitability is very site specific and dependent upon ground conditions.

Industrial Effluent

There are many vegetable washing, grading and processing sites associated with the intensive agriculture in the area, and wherever possible recycling of waste water is encouraged to minimise the impact of waste water on the environment. Twenty operators within the Plan area treat their own effluent, rather than drain to foul sewer, and hence discharge effluent to a watercourse.

Thirteen of these are of volumes > 5 m^3/day. These include discharges from fish farms, gravel workings, and from the food processing industry.

Discharges to surface or groundwater are shown in Map No. 11

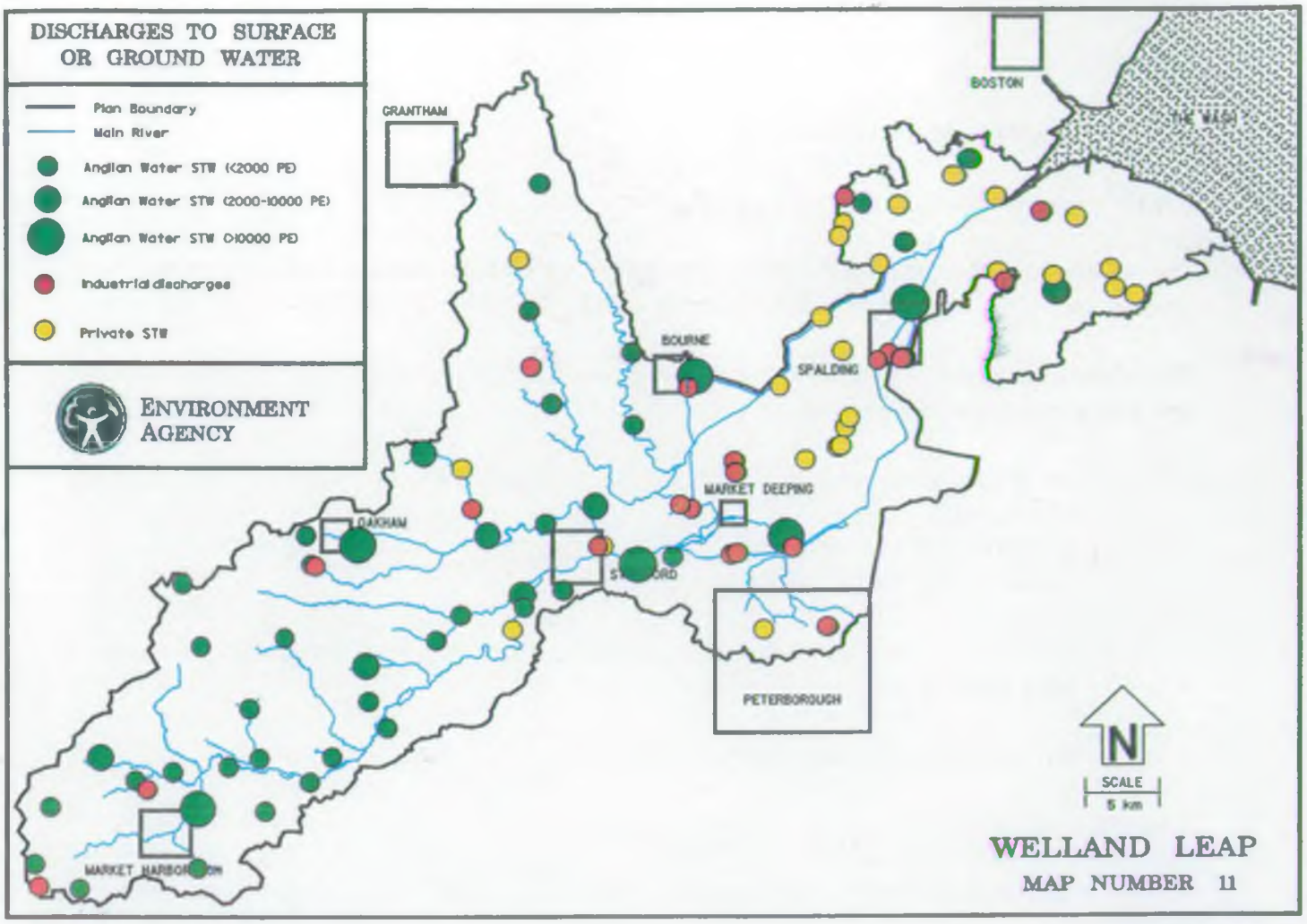
5.4.3 The Role of Key Players

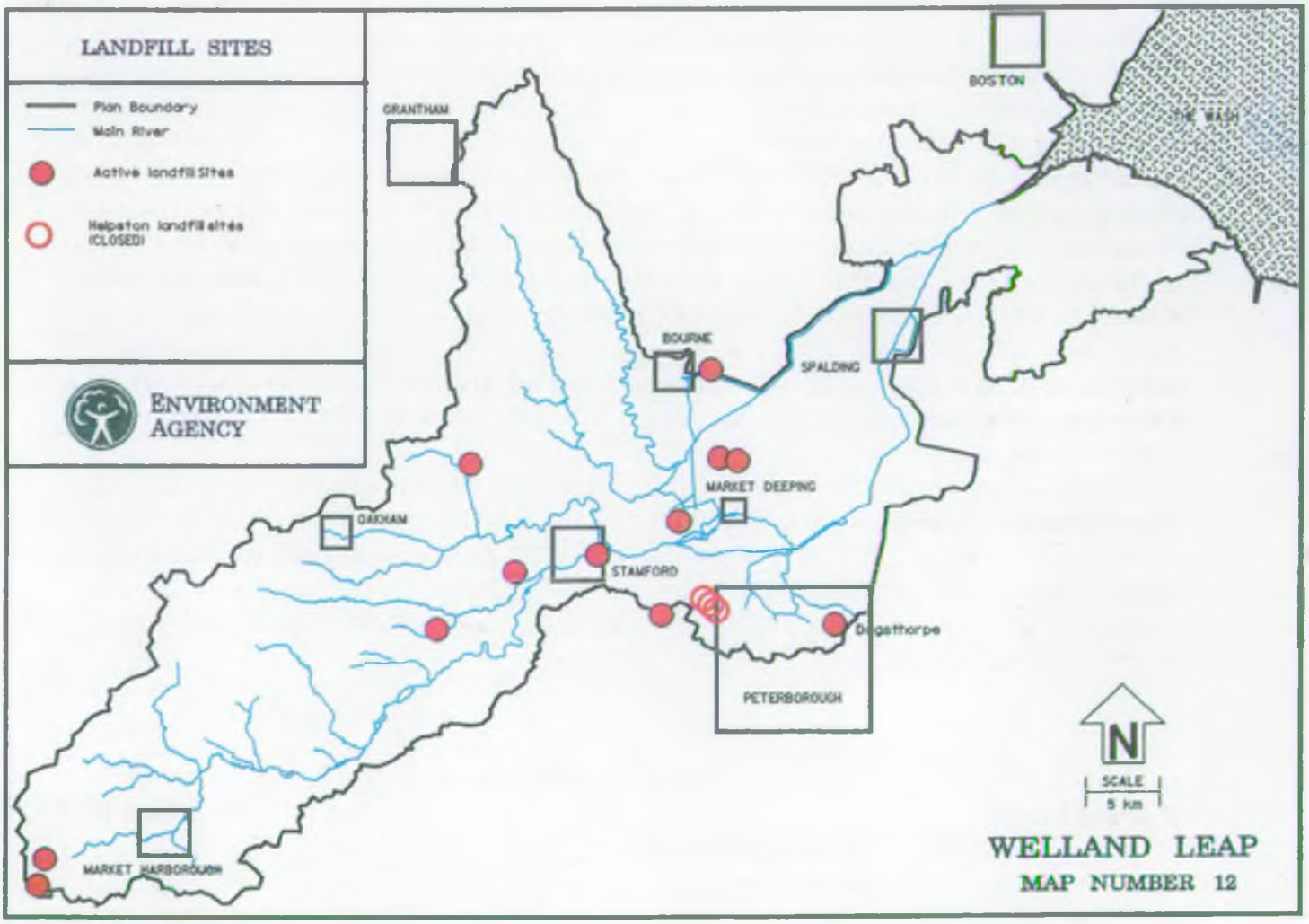
We try to maintain and improve water quality in a number of ways which include:

- the regular monitoring of water quality, in both chemical and biological terms,
- by issuing and enforcing permissions - Discharge Consents/Notices, Waste Management Licences and IPC Authorisations (permissions specify limits on the quality and quantity of materials which may be discharged);
- by the regular monitoring of discharges;
- by setting water quality objectives for local Water Quality Management needs;
- through our influence in the planning process.

The Agency encourages site operators, farmers and developers to protect surface water by providing adequate pollution prevention measures, such as bunding oil and chemical tanks, installing oil interceptors (where appropriate) and appropriate storage of silage and slurry etc. However, many industrial sites have separate drainage systems for foul and surface waters and site operators may discharge material, often unknowingly, to a drain which discharges directly to surface waters. Where a pollution does occur we have powers to alleviate the effects of pollution and to recharge the costs if the polluter can be identified. Prosecution through the courts may be undertaken both of those responsible for isolated pollution events and of those dischargers who repeatedly contravene their discharge conditions.

The *Environment Act 1995* has put a new responsibility on water companies to provide "First Time" public sewerage systems for those villages without such, provided the necessary criteria are met. We have two roles in this process: firstly we provide factual information from our records to aid Anglian Water Services in their assessment of applications; and secondly we have a separate independent role as the arbiter in the event of disputes between applicants and AWS, in respect of decisions made.


DISCHARGES TO SURFACE OR GROUND WATER
Plan Boundary
Main River
Anglian Water STW (<2000 PE)
Anglian Water STW (2000-10000 PE)
Anglian Water STW (>10000 PE)
Industrial discharges
Private STW
ENVIRONMENT AGENCY
BOSTON
GRANTHAM
THE WASH
BOURNE
SPALDING
MARKET DEEPING
OAKHAM
STAMFORD
PETERBOROUGH
MARKET HARBOROUGH
N
SCALE
5 km
WELLAND LEAP
MAP NUMBER 11


LANDFILL SITES
Plan Boundary
Main River
Active landfill sites
Helpston landfill site (CLOSED)
ENVIRONMENT AGENCY
BOSTON
GRANTHAM
THE WASH
BOURNE
SPALDING
MARKET DEEPING
OAKHAM
STAMFORD
Deeping
PETERBOROUGH
MARKET HARBOROUGH
N
SCALE
5 km
WELLAND LEAP
MAP NUMBER 12

5.5 WASTE MANAGEMENT

5.5.1 General

The generation of waste is an inevitable consequence of many human activities, arising from sources including the home, industry and agriculture.

Waste disposal has the potential to harm the environment through contamination of air, ground and water in a number of ways:

- the pollution of ground or surface water by leachates (contaminated water) escaping from landfill sites;
- the escape of landfill gases such as methane;
- the contamination of land on which waste management and other industrial activities have taken place;
- nuisances such as litter, odours and vermin.

Landfill sites to which waste is disposed may be licensed to accept one or more categories of waste ranging from inert material (soil, brick, stone) to degradable material (wood) to putrescible waste (household arisings, food processing waste) to Special Wastes (wastes which pose a particular risk to the environment or human health).

In the past, landfill activity followed the 'dilute and disperse' principle. This assumed that any leachate generated was retained in close proximity to the site for sufficient time to allow natural degradation and/or dilution to occur. For such sites, where leachate migration may prove a threat to ground or surface waters, monitoring is undertaken and action taken where necessary. The current philosophy is that new landfill sites, receiving leachate generating wastes, should be constructed to fully contain wastes using either natural or artificial liners thus minimising the risk of groundwater contamination. These sites also have relevant monitoring programmes. When landfilling has been completed, sites are now required to be capped with a low permeability material to further minimise infiltration of rain water.

Land is also used in other associated waste management activities such as recycling operations, waste transfer stations, incinerators and scrap yards. These uses also create a risk of pollution to the environment.

Landfill sites are shown on Map No. 12

5.5.2 Local Perspective

Despite the Plan area extending into four Counties (Cambridgeshire, Leicestershire, Lincolnshire and Northamptonshire) it contains relatively few waste management facilities:

Landfill sites ("active")	12
Civic amenity/recycling centres	5
Transfer stations	4
Metal recycling centres (Scrapyards)	11
Recovery/treatment plants	3
Total	35

There is only one major site in terms of capacity and the range of wastes taken. This is the Dogsthorpe landfill operated by Shanks and McEwan Ltd. north of Peterborough.

One other waste management activity reflects the influence of agriculture in the area - that is a significant volume of vegetable processing waste is spread onto farmland as fertiliser/conditioner.

5.5.3 Role of Key Players

Our principal role in protecting land is through waste management licensing. This is achieved through the granting of licences for the deposit, treatment, keeping or disposal of waste and through the supervision of licensed activities to ensure licence conditions are complied with. Various sanctions are available to us to apply against both licence holders who do not fulfil their licence conditions and against those who carry out illegal waste disposal activities. Waste management licences ensure waste disposal sites are controlled during both operational and post-closure phases. For those sites closed post May 1994, the surrender of a Waste Management Licence is only permissable when a site no longer poses a risk of pollution and if it does not pose a risk to human health.

We seek to protect groundwater quality against discharges of dangerous substances by ensuring new sites taking potentially polluting matter are engineered to fully contain and control leachate generation.

Historically, waste management was primarily concerned with the disposal of waste. Now there is a considerable shift to considering waste reduction, reuse and recovery before disposal. This is reflected in legislation such as that covering producer responsibility for packaging waste which puts the onus for recovering this type of waste on the producer himself.

County Councils as planning authorities influence waste disposal in their area through the Structure, Local and Waste Plans (for which we are consultees). As the Highway Authority, the County Council is also responsible for waste and litter deposited on the highways.

District and Borough Councils are responsible for all domestic refuse collection and street cleansing, as well as keeping clean any land under their control.

Waste disposal operations including the management of sites handling industrial and domestic waste may be undertaken by the private sector. Most waste collection is carried out by private operators, especially the removal of industrial, construction, and demolition waste.

Compaction of waste in a landfill site

5.6 MINERAL EXTRACTION

5.6.1 General

The extraction of materials such as sand, gravel and limestone from quarries and mines can damage both underground and surface water resources and can indirectly impact on water quality. The damaging effects of mineral extraction are often long term and sometimes permanent. The influence of quarrying upon the water table may extend for a number of miles, impacting on public water supplies from groundwater sources and flows to springs and rivers (and therefore on the natural environment).

During extraction, de-watering can cause suspended solids to be discharged to rivers and the industrial nature of the activity poses other pollution risks such as oil contamination. Land formerly used for mineral extraction is also used in other associated waste management activities such as recycling operations, waste transfer stations, incinerators and scrap yards which carry associated risks. Any lake created by extraction can, if directly connected to the river, seed the river with algal material causing changes in the downstream water quality.

The manner in which site restoration is undertaken can also impact on the environment. Backfilling with low permeability material will decrease the storage capacity of the aquifer, and leaving the site to open water will cause the loss of resource due to evaporation losses being greater than precipitation gains. Restoration to low level agriculture may require continual pumping which is not a sustainable use of resources. The subsequent use of mineral extraction sites for landfill also poses a significant threat to groundwater quality.

Many disused gravel pits are ultimately developed to create valuable conservation habitats and recreational areas..

5.6.2 Local Perspective

There are a number of mineral sites in the Plan area, primarily involving sand, gravel and limestone.

The main sand and gravel resources occur in the south of the Plan area around Baston-Langtoft-West Deeping and Peterborough. Sand and gravel from these sites form an important source of aggregate minerals, used primarily in the construction industry as building sand or in the manufacture of concrete. The use for non-aggregate purposes traditionally involves only a very small quantity of material.

Limestone is extracted at a number of smaller sites, particularly in the area around Castle Bytham. The Oolitic limestone of the Jurassic series forms the principal limestone resource of the area and whilst its principle use is as an aggregate, a significant proportion of output is for non-aggregate purposes, notably for agricultural lime. Better quality stone is suitable for building purposes and building stone is currently quarried at Holywell.

Brick clay is also extracted from a site near Peterborough and although the brick making industry has in the past been a notable part of the Peterborough scene, there are no active brick works remaining in the district.

5.6.3 Role of Key Players

All County Councils within the catchment have produced Mineral Plans as required under the Town and County Planning Act 1990, in accordance with Planning Policy Guidance Note 12. As a statutory consultee we make comment upon these Plans to ensure that the flow, level and quality of surface and ground waters are protected.

5.7 THE USE OF WATER - ABSTRACTION

5.7.1 General

Water is abstracted and used by man for a number of uses: to support the Public Water Supply system, for industrial use, for general agriculture (eg. livestock watering and for mixing chemicals), for spray irrigation purposes and to a limited extent directly for domestic use (isolated properties). These demands for water are in direct competition with those of the flora and fauna associated with aquatic ecosystems which are dependant on the flows within watercourses and the groundwater which supports river flows.

Reduced river flows as a consequence of abstraction can also impact on water quality by reducing the ability of rivers to adequately dilute effluent inputs and/or by encouraging the eutrophic state of watercourses. This can also impact upon it's use for amenity purposes.

Water is abstracted from both groundwater and surface water sources. Groundwater is that which is abstracted from underlying strata using wells and boreholes. Surface water is that contained in rivers and still-waters such as lakes and reservoirs. Surface water may be stored, for later distribution and abstraction, in storage reservoirs (constructed to meet public supply and agricultural needs) and to a limited degree within drainage systems. Enhanced abstraction may also be facilitated by the transfer of water from one river system to another.

The water we draw upon is not infinitely available, the limiting factor being the rate at which it is replenished by rainfall. It is therefore important to manage this valuable and fragile resource in a sustainable manner. This entails careful management, balancing the varied and competing needs for the water available.

5.7.2 Local Perspective

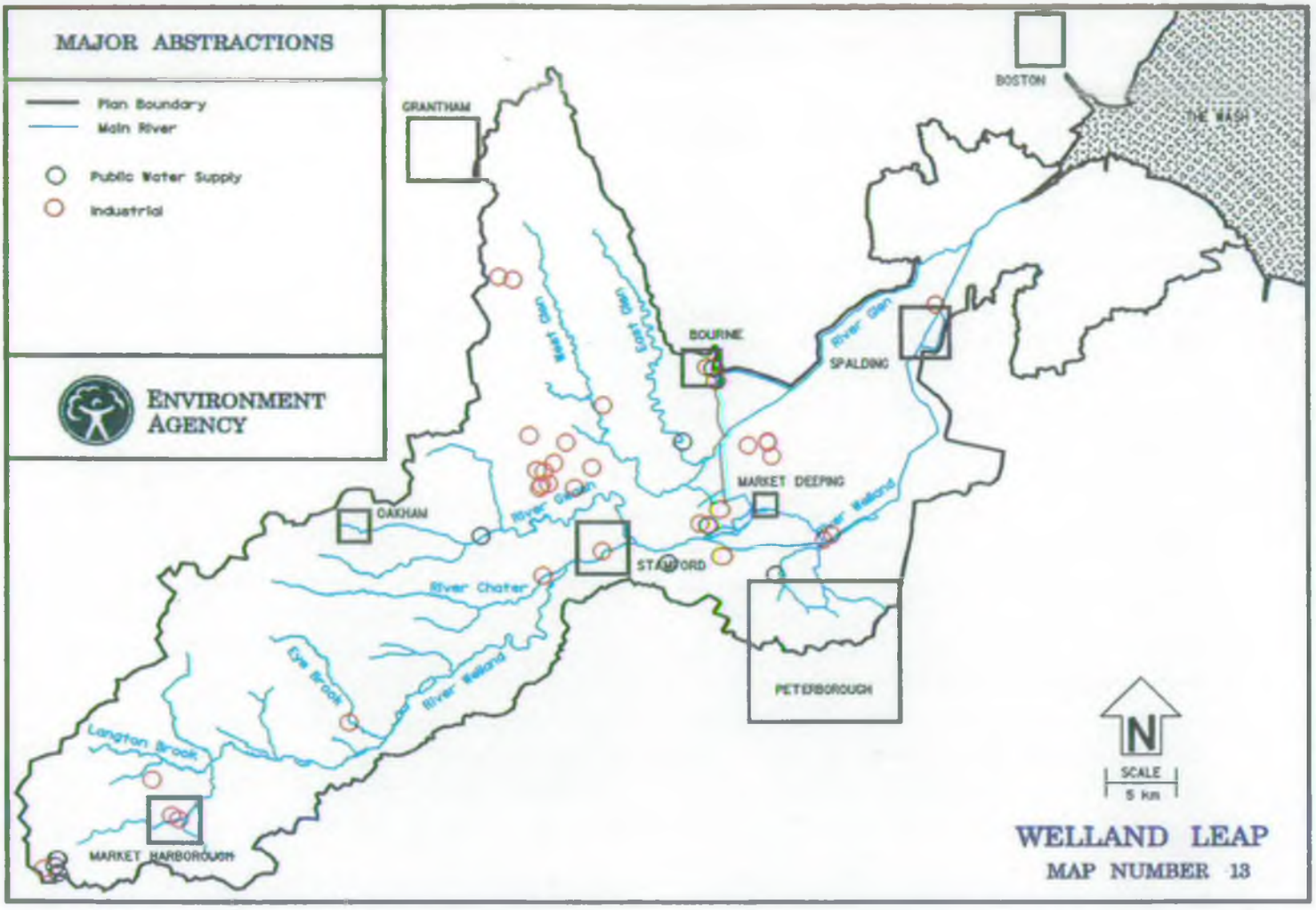
The principle sources of water in the area are Rutland Reservoir which takes its water from the Rivers Welland and Nene and the Southern Lincolnshire Limestone aquifer.

Map No.13 shows the extent of abstraction in the area and the volumes of water abstracted by the different category of use .

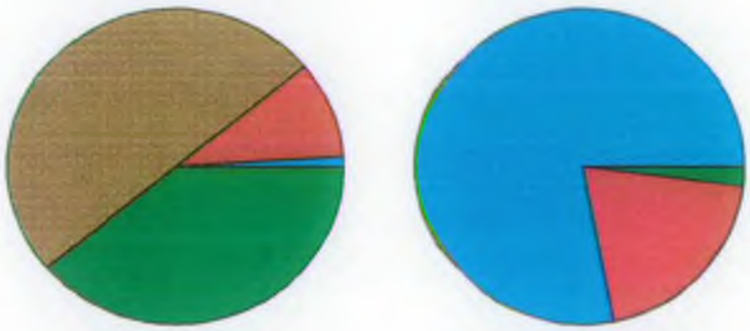
Although licence numbers are dominated by agricultural and spray irrigations (88%) the principle use of water within the Plan area is for public water supply. PWS licences which whilst numbering only just over 1% of all licences, account for 78% of total licensed water.

5.7.3 Role of Key Players

Our role with respect to abstraction and the management of finite water resource is to administer the system of licensing abstractions and impoundments and by development of river transfer schemes as appropriate. We have powers to decide whether or not a licence may be granted, the conditions applied to it, and the power to vary licences.



ABSTRACTION LICENCES



NUMBER OF LICENCES

USE	LICENCES	% OF TOTAL
PWS	5	1
INDUSTRIAL	42	10
AGRICULTURAL	200	50
SPRAY IRRI'	155	39
TOTAL	402	100

LICENSED ABSTRACTION

USE	TCMA	% OF TOTAL
PWS	143 210	78
INDUSTRIAL	35 923	20
AGRICULTURAL	378	<1
SPRAY IRRI'	3 457	2
TOTAL	182 968	100

5.8 LAND DRAINAGE AND FLOOD DEFENCE

5.8.1 General

Land drainage and flood defence activities are fundamental to maintaining the economic and social infrastructure of the nation. We are dependant on both to sustain our intensive use of land for food production and to provide land fit for development and habitation.

Fluvial Defences

Over the centuries, in East Anglia in particular, natural river systems have been radically altered to assist in the improvement and reclamation of land, primarily for agricultural purposes. This has taken the form of the construction of embanked channels and lowland drainage systems. Together these have created an artificial environment relatively devoid of wildlife and habitat diversity. Even in the upland parts of river catchments, extensive alterations have taken place to improve land drainage for agricultural purposes and provide flood defences for many rural and urban areas.

The natural process wherein rainfall would reach the river systems either directly or via local drains and groundwater movement is further altered by man's activities:

- Development of housing, roads and industry effectively waterproofs the land thereby increasing the rate at which rainfall reaches the river system - this can lead to an increased risk of flooding both to the developments themselves and areas downstream;

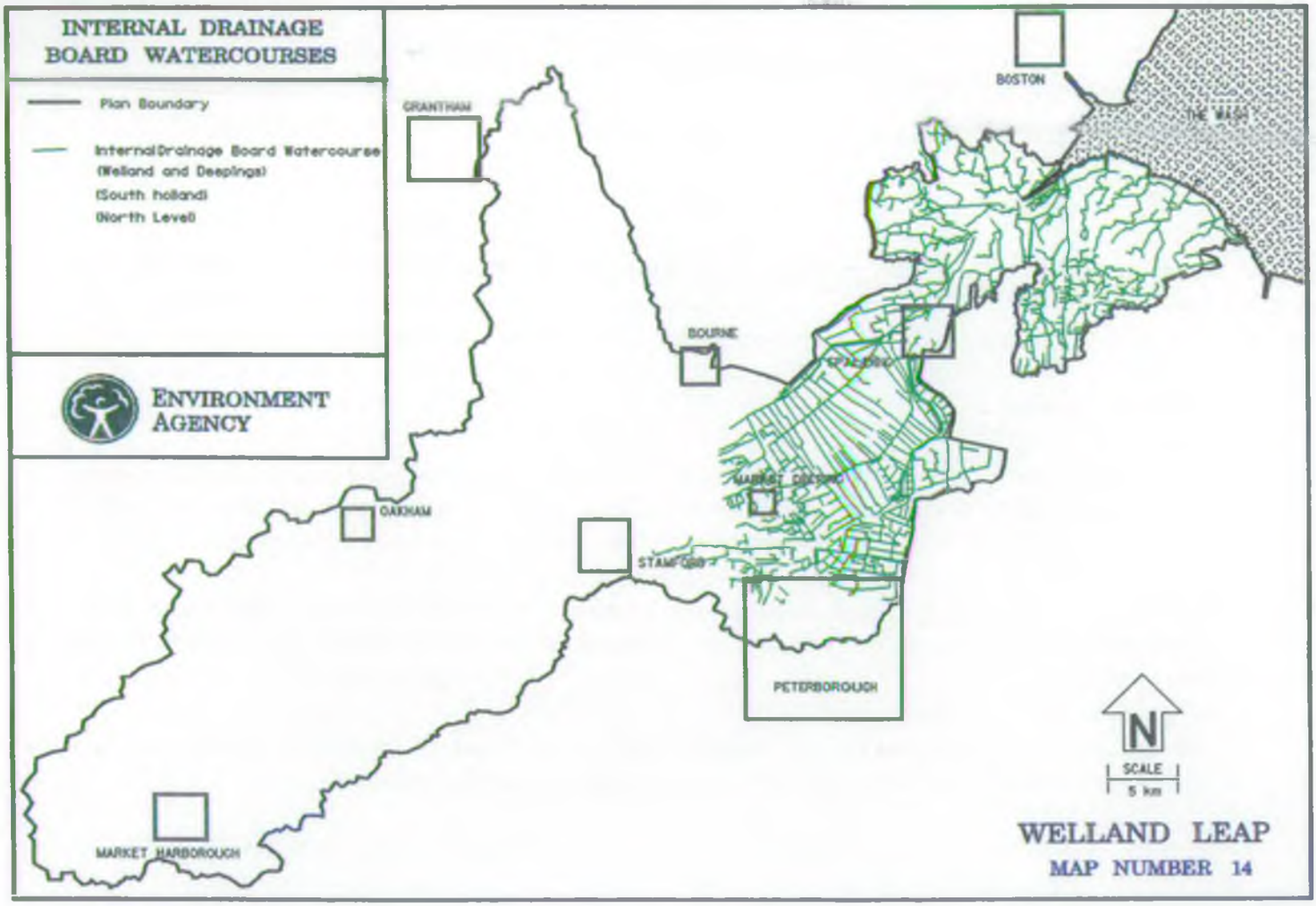
- Agricultural drainage schemes can have a similar effect.

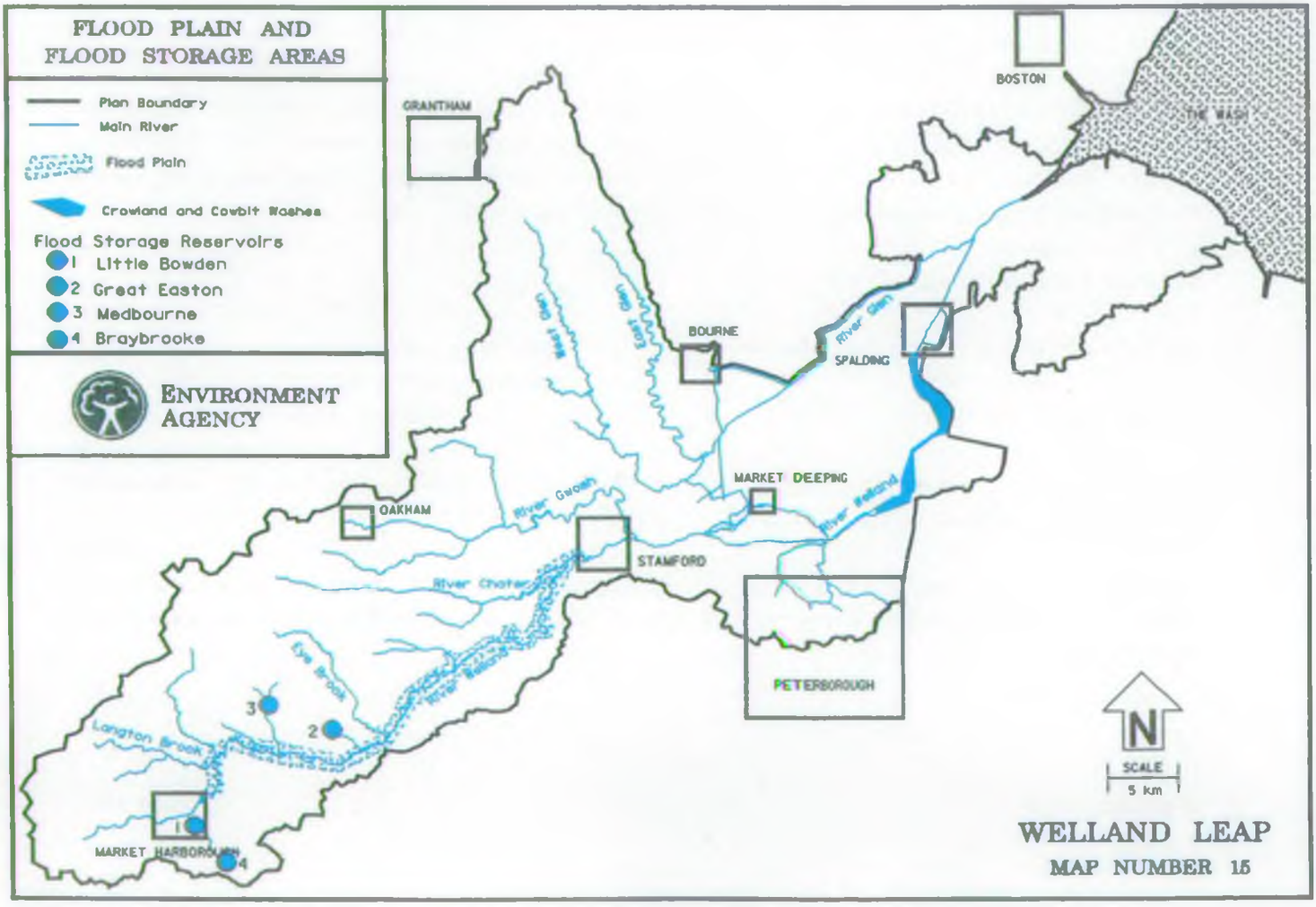
The maintenance of river systems is essential to prevent flooding of property, risk to life and the continuation of farming practices. In recent years these maintenance regimes have become an increasing source of conflict in finding a balance between the need to protect and enhance the environment whilst maintaining established defence standards.

Sea and Tidal Defences

Much of the land bordering the coast of East Anglia is low lying and protected against flooding by sea defences which have been built and rebuilt over many years by our predecessors. Wind and wave action produced by extreme weather conditions in the North Sea coinciding with high spring tides can produce tidal surges which may overtop or breach sea defences resulting in extensive flooding, severe property damage and loss of life. This occurred in 1953 when over 300 people perished along the East coast.

Sea defences can take many forms ranging from heavily engineered concrete walls through earth banks to sand/shingle beaches or any combination of these. The need to maintain these and to improve them to combat sea level rise results in similar conflicts as described above.


INTERNAL DRAINAGE BOARD WATERCOURSES
Plan Boundary
Internal Drainage Board Watercourse
(Welland and Deepings)
(South holland)
(North Level)
ENVIRONMENT AGENCY
GRANTHAM
BOSTON
THE WASH
BOURNE
OAKHAM
STAMFORD
PETERBOROUGH
MARKET HARBOROUGH
N
SCALE
5 km
WELLAND LEAP
MAP NUMBER 14


FLOOD PLAIN AND FLOOD STORAGE AREAS
Plan Boundary
Main River
Flood Plain
Crowland and Cowbit Washes
Flood Storage Reservoirs
1 Little Bowden
2 Great Easton
3 Medbourne
4 Braybrooke
ENVIRONMENT AGENCY
GRANTHAM
BOSTON
THE WASH
BOURNE
SPALDING
River Glen
West Glen
East Glen
MARKET DEEPING
River Welland
OAKHAM
River Gwash
STAMFORD
River Chater
Eye Brook
Langton Brook
PETERBOROUGH
MARKET HARBOROUGH
N
SCALE
5 km
WELLAND LEAP
MAP NUMBER 15

5.8.2 Local perspective

Fluvial Defences

To the east of Peterborough, Stamford and Bourne, the Welland and Glen flow through fen land, generally in embanked channels at a level often significantly above the surrounding land. There are no natural flood plains and the flood defence is provided by the embankments supplemented in certain locations by flood relief channels such as the Coronation Channel at Spalding and the Maxey Cut at Market Deeping. The Crowland and Cowbit Washes are historic washlands which provide flood storage in the event of flood waters being unable to discharge to the sea during adverse tidal conditions. The surrounding land is drained by a network of channels and pumping stations maintained by three Internal Drainage Boards. Within this part of the catchment we own and operate two major land drainage pumping stations at Bourne Eau and Peakirk.

To the west of this fen area, the catchment is hilly and drained by a range of natural and semi-natural watercourses. The Welland itself is characterised by a fairly broad flood plain between the two major population centres of Stamford and Market Harborough. Within these towns, defences are provided by a combination of lengths of flood wall and embankment. The villages of Medbourne, Great Easton, Braybrooke and Little Bowden have a history of flooding and the defences here are primarily provided by flood storage reservoirs sited upstream.

Maps Nos.14 and 15 show Internal Drainage Board watercourses in the area and areas of flood plain and storage.

Sea and Tidal Defences

The River Welland is tidal downstream from Marsh Road Sluice in Spalding, over a distance of 22 km to its outfall into the Wash at Tabbs Head. Within this length the River Glen flows into the Welland at Surfleet where there is a tidal sluice. Three major IDB drains also outfall into this length. Defences are provided by earth embankments which themselves are protected against erosion damage by stone protection within the channel and a low area above normal water level in front of the banks known as a berm. The sea defence frontage is also an earth bank which is afforded protection by the presence of a salt marsh of varying width in front. There is also a second line sea defence provided by a lower earth embankment set back at varying distance from the first, this being the original defence prior to improvement.

5.8.3 Role of Key Players

Our role with respect to flood defences is far reaching. Most obvious among our responsibilities is our power to carry out the maintenance, improvement or construction of flood defence works on Main River and Sea Defences and to provide flood warning systems. We also have regulatory powers to exercise control over other parties' works, affecting watercourses, by means of a consenting process; and enforce Byelaws which prohibit certain actions which would affect flood defence works.

Flood defence works are carried out under the auspices of the Regional Flood Defence Committees (RFDCs), who in turn delegate certain actions to Local Flood Defence Committees (LFDCs).

The Welland and Nene Local Flood Defence Committee are responsible for discharging the Agency's flood defence function within the Welland catchment in accordance with the duties and powers as set out in the Water Resources Act 1991. The Committee are responsible for:

- raising and approving the annual flood defence revenue budget and delivering the works identified therein;

- developing a Long Term (10 year) Capital Plan (LTP) which identifies and costs the future needs for improving and replacing flood defences.

Internal Drainage Boards (IDBs), administer drainage districts established within particularly low lying parts of England and Wales where flood protection and land drainage are necessary to sustain both agricultural and developed land use. These districts are often heavily reliant on pumped drainage. IDBs have the same powers in respect to watercourses within their districts as we have with regard to Main river.

Local Authorities have permissive powers under the Land Drainage Act 1991, similar to those of the Agency, which relate to those watercourses not designated Main River and not within an IDB area. In addition they have a number of powers under the Public Health Act 1936 relating to blocked watercourses and their culverting.

Riparian owners, that is to say owners of land on the banks of a watercourse, are entitled to certain rights under common law such as the right to discharge surface water from their land and the right to protect this land against flooding. Such rights however do not absolve them from the need to obtain consent for works which might affect the flow of water in any watercourse.

5.9 LANDSCAPE AND HERITAGE

5.9.1 General

The historic landscape and archaeological assets of the environment include features of the countryside such as hedges, walls, ditches and hay meadows, along with archaeological features which include bridges and deserted villages etc. Some sites protected or managed for their historic interest are also valuable for wildlife and as a result can form important habitats.

Change of land use and development (including farming practices and flood defence works) may result in ground disturbance and alter water table levels. Such change exerts a constant pressure on our landscape and archaeological heritage. In addition to their own intrinsic value rivers, lakes, wetlands and alluvium-covered areas can be important it terms of archaeology because of the types of site preserved and the possibility of anaerobic conditions permitting the preservation of organic materials. Archaeological remains in these environments are possibly the least well documented, probably because, until disturbed, remains preserved in these areas are among the best protected in the country. Water levels may be critical to preserving remains - an increase may result in erosion whilst a decrease may lead to the destruction of previously water-logged deposits.

5.9.2 Local Perspective

The Plan area extends from the Northamptonshire uplands at Sibbertoft to the coastal marshes of the Wash. The upper river valleys were once famous for their grazing pastures, although today these are increasingly being brought into arable cultivation, resulting in a landscape of lost water meadows, straightened river channels, depleted hedgerows and relatively sparse tree cover. Two large bodies have been created to fulfil man's need for water at Rutland and Eye Brook reservoirs. Rutland Water is the largest man-made lake in Europe.

The River Welland cuts through the Jurassic Limestone ridge which extends from north of Grantham, south to Stamford and beyond. The villages near the river in the upper valley sit on hilltops and form an important focal point in the visual envelope of the valley. Limestone is the historic building material here, with most churches and farms, much of Stamford, and the majority of the villages being built in this attractive material. The Welland is spanned by a number of medieval bridges such as those at Stamford and Duddington built from limestone, many of which are listed monuments.

One famous landmark just upstream of Stamford is the Harringworth viaduct, built in Victorian times. This notable structure has some eighty arches and still bears rail traffic today.

Downstream of Stamford the landscape changes dramatically into Fen and assumes an entirely different character. Except for isolated 'fen islands' and raised embankments alongside drainage ditches, the land is flat, rarely reaching 10m above sea level. The land is predominantly cultivated with little natural or semi-natural habitats remaining, many having already been lost to reclamation and intensive agricultural processes. Isolated settlements and remote farm

buildings are characteristic features and the area has a rich archaeological resource that includes medieval and Roman, as well as important prehistoric sites.

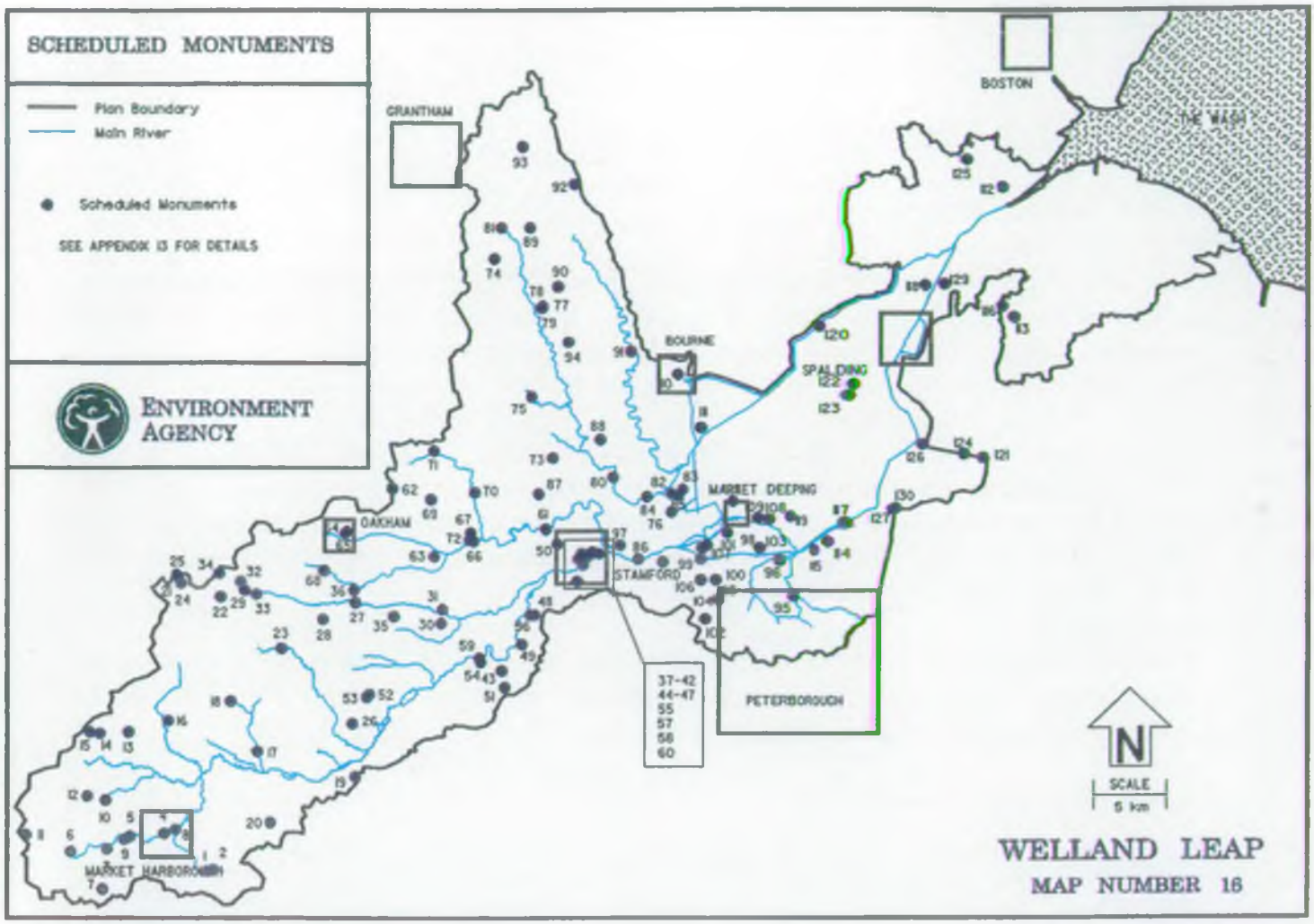
Scheduled Monuments and Site of Conservation Importance are shown on Map Nos. 16 and 17

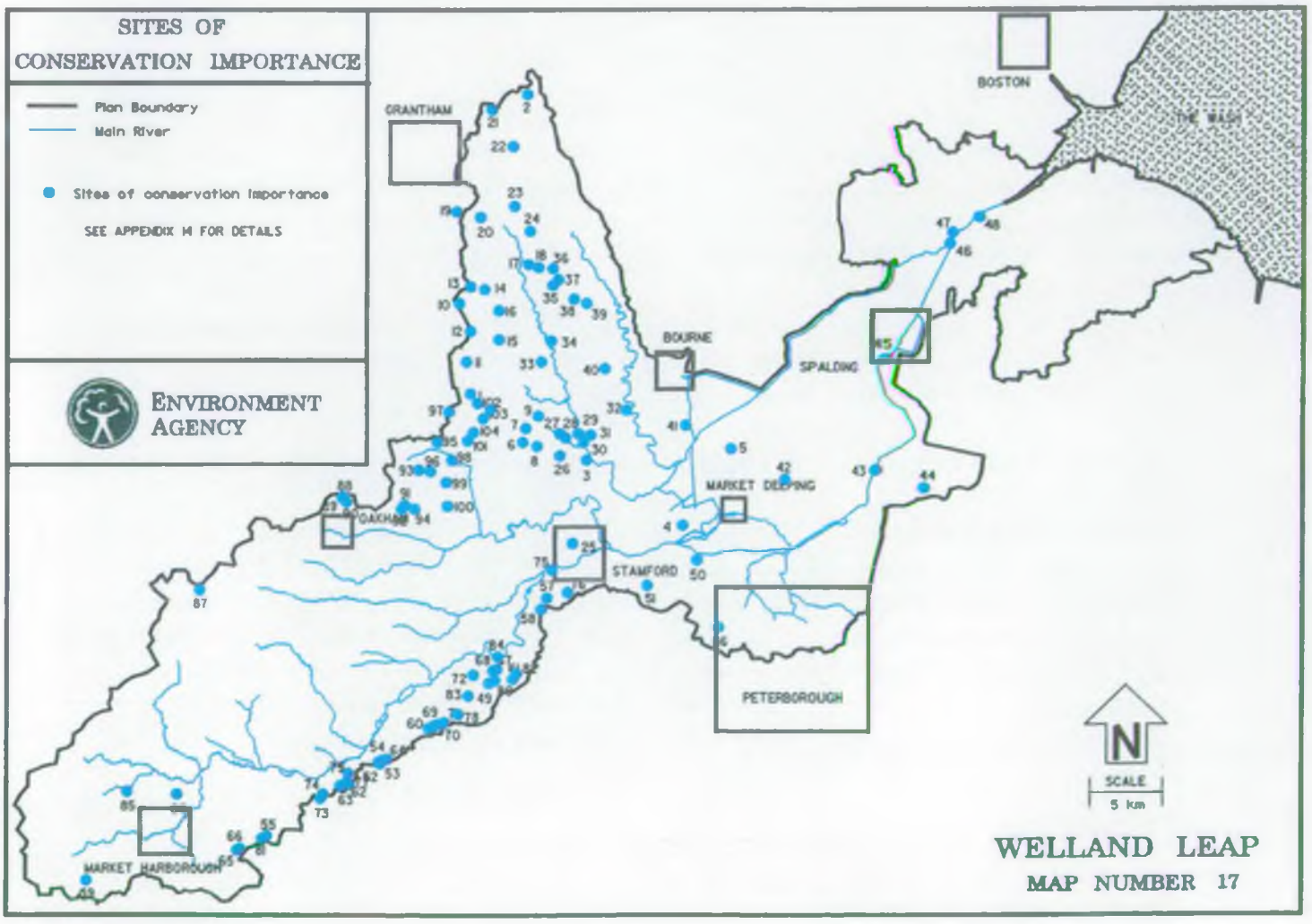
Crowland Abbey

5.9.3 Role of Key Players

We have a duty to have regard to features of archaeological and historic interest and to further the conservation of flora and fauna during all aspects of our work. From an operational perspective we undertake the appropriate consultation procedures. This includes consulting with the County Archaeologist on any scheme which involves the movement of soil or changes in water levels.

MAFF's role in the protection of landscape is addressed through the promotion of their Environment Sensitive Areas scheme, and by its incorporation into various other legislation. Under the ESA scheme, MAFF promote farming methods which protect and enhance wildlife, landscape and historic features. Countryside Stewardship agreements offer similar incentives to farmers.


SCHEDULED MONUMENTS
Plan Boundary
Main River
Scheduled Monuments
SEE APPENDIX 13 FOR DETAILS
ENVIRONMENT AGENCY
GRANTHAM
BOSTON
THE WASH
BOURNE
SPALDING
MARKET DEEPING
OAKHAM
STAMFORD
PETERBOROUGH
MARKET HARBOROUGH
37-42
44-47
55
57
58
60
N
SCALE
5 km
WELLAND LEAP
MAP NUMBER 16


SITES OF CONSERVATION IMPORTANCE
Plan Boundary
Main River
Sites of conservation importance
SEE APPENDIX 14 FOR DETAILS
ENVIRONMENT AGENCY
GRANTHAM
BOSTON
THE WASH
BOURNE
SPALDING
MARKET DEEPING
OAKHAM
STAMFORD
PETERBOROUGH
MARKET HARBOROUGH
N
SCALE
5 km
WELLAND LEAP
MAP NUMBER 17

5.10 THE NATURAL ENVIRONMENT

5.10.1 General

East Anglia is rich in wildlife with over one third of the key species and important habitats identified in the "UK Biodiversity Action Plan" being found here. However over the past decades, dramatic reductions in habitat and species have occurred, making what remains even more precious.

Of significant relevance to the role of the Agency is that element of bio-diversity which is dependent upon the water environment, both within the river corridor and in sites of conservation value which are water dependent. These habitats support a diverse range of plants and animals ranging from those species wholly dependent on open water to species which exploit river corridors and wetlands as valuable refuges.

Pressures upon bio-diversity are wide ranging and include the construction of flood defences, land drainage practises, low river flows exacerbated by the abstractive demand for water, and the influence of human activities on water quality.

5.10.2 Local Perspective

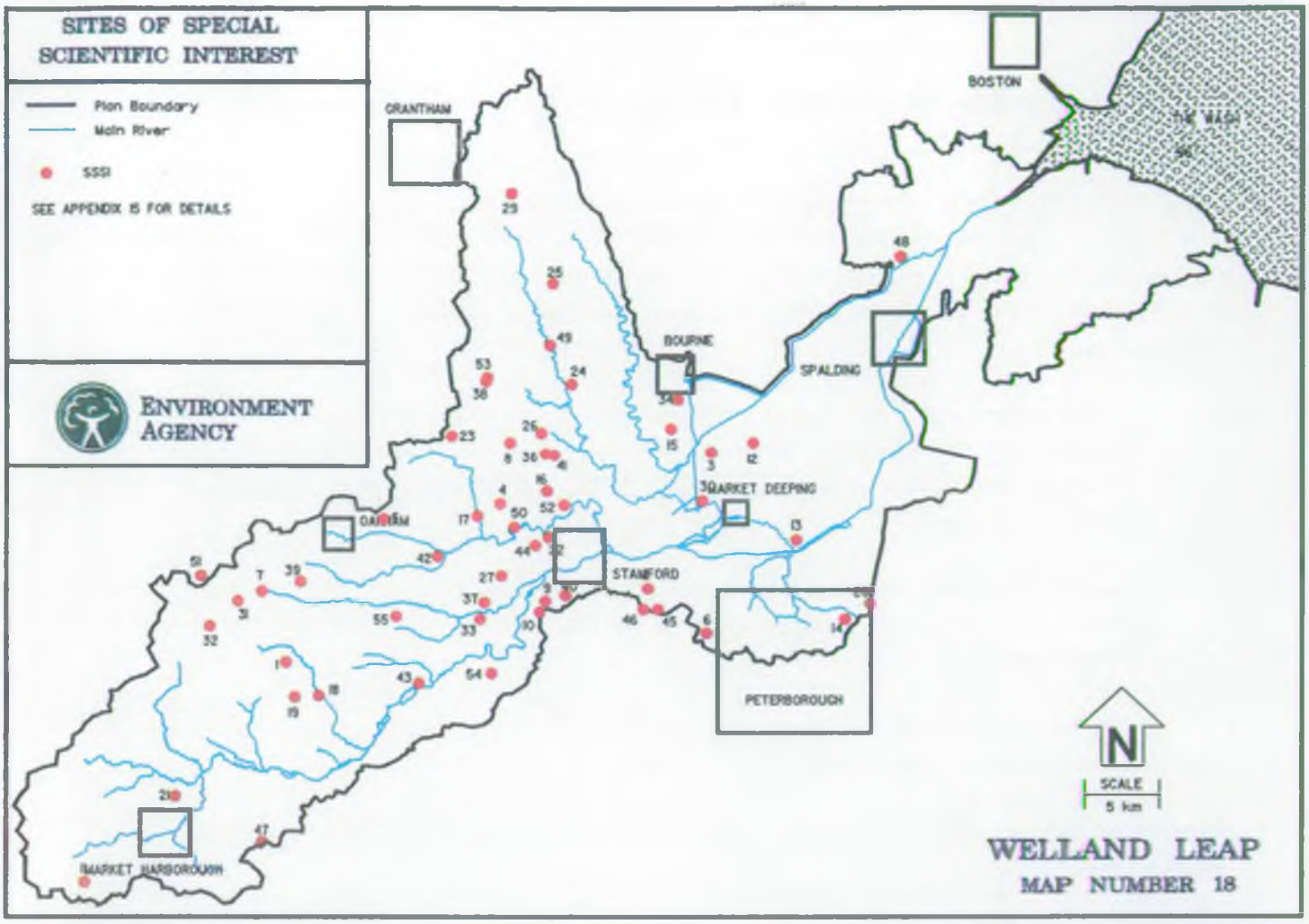
The natural environment of this area benefits from a varied landscape. The fens cover a large area of low-lying land that drains slowly towards the Wash, its boundaries typically drawn along a series of catchwater drains and dykes. The land is predominantly cultivated with little natural or semi-natural habitats remaining, many having already been lost to reclamation and intensive agricultural processes.

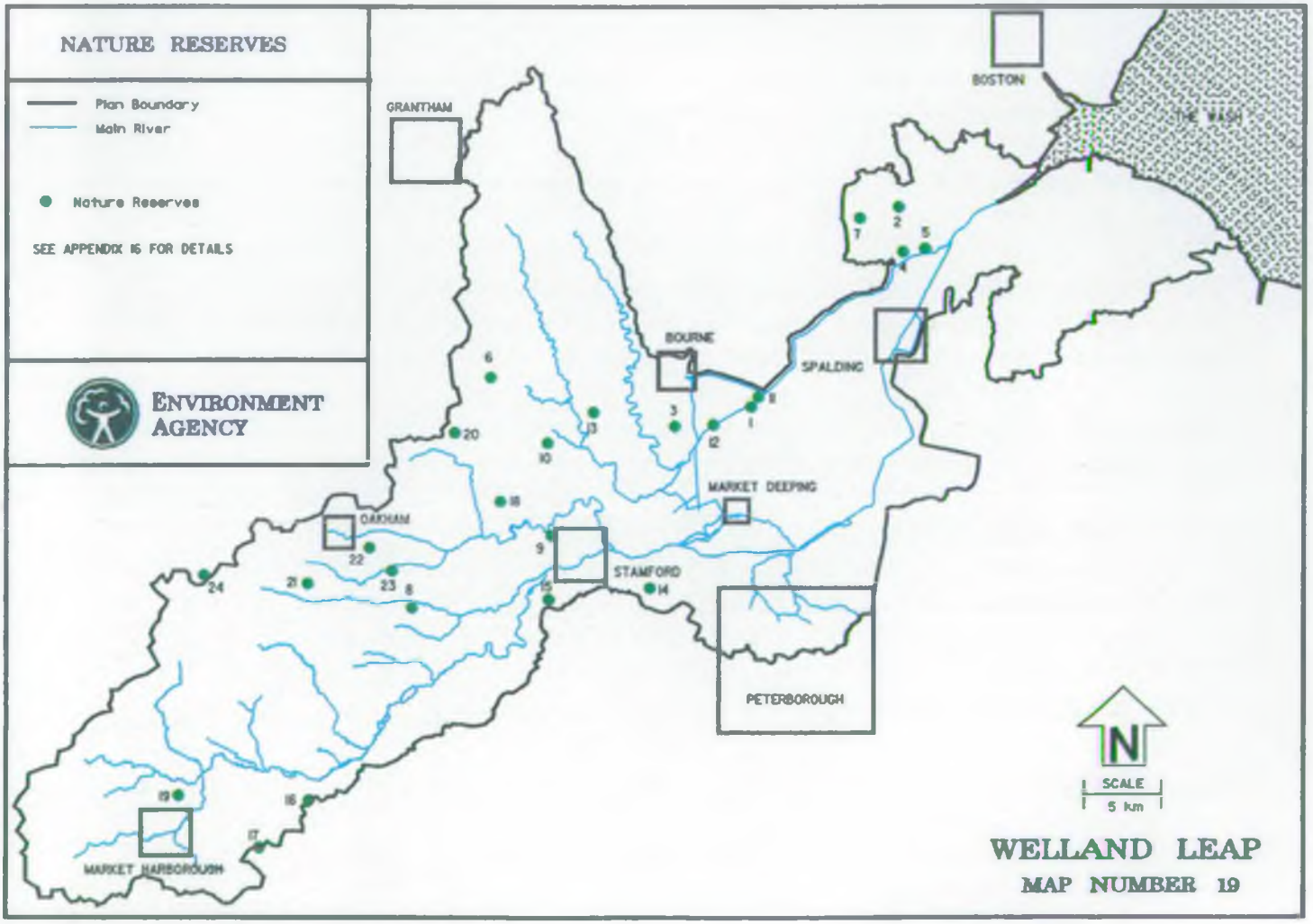
To the south and west of Bourne the area has a gently undulating relief with plateaux, divided by broad shallow valleys and characterised by arable cultivation. Woodland cover is generally sparse, with small ancient woodlands and plantations scattered within the river valleys and on the hillsides, harbouring valuable populations of fungi and invertebrates as well as important breeding populations of woodland birds.

The coastline of the Wash has a range of habitat types including saltmarsh and inter-tidal mudflats which are home to diverse species of flora and flora. These are of both national and international importance for conservation purposes.

Map Nos. 18 and 19 show Sites of Special Scientific Interest and County Nature Reserves.

County Nature Reserves and Sites of Special Scientific Interest are shown on the Map opposite. Of particular note is Rutland Water, which is both a SSSI and Ramsar site, important for both migratory and resident bird populations, and now has breeding lapwing and redshank. Also of note is Baston Fen a wetland habitat which is managed in the traditional way with wet ditches and summer grazing and attracts wading birds such as snipe. The river corridors are also important to other species of animals particularly to the Daubenton bat and pipistrelle bat (on the Biodiversity Action Plan list of species to be protected) which feed and roost over the river


SITES OF SPECIAL SCIENTIFIC INTEREST
Plan Boundary
Main River
SSSI
SEE APPENDIX 15 FOR DETAILS
ENVIRONMENT AGENCY
BOSTON
GRANTHAM
BOURNE
SPALDING
THE WASH
MARKET DEEPING
OAKHAM
STAMFORD
PETERBOROUGH
MARKET HARBOROUGH
N
SCALE
5 km
WELLAND LEAP
MAP NUMBER 18


NATURE RESERVES
Plan Boundary
Main River
Nature Reserves
SEE APPENDIX 16 FOR DETAILS
ENVIRONMENT AGENCY
BOSTON
GRANTHAM
BOURNE
SPALDING
THE WASH
MARKET DEEPING
OAKHAM
STAMFORD
PETERBOROUGH
MARKET HARBOROUGH
N
SCALE
5 km
WELLAND LEAP
MAP NUMBER 19

corridor. Otters released by the local Otter Trust in 1994 are known to be successfully breeding on the Upper Welland and its tributaries.

5.10.3 The Role of Key Players

We have a duty when exercising all our functions to promote and further the conservation of flora and fauna. In formulating our proposals or considering proposals from other parties, we must take into account:

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

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

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

Department of the Environment have ultimate responsibility for the national conservation policies of the Agency.

English Nature are the statutory body responsible for nature conservation and the designation of SSSI's in England.

Countryside Commission are the statutory body responsible for the conservation of landscape and promoting access to the countryside in England.

English Heritage are the statutory body responsible for matters of archaeological interest and historic buildings.

Non-Governmental Conservation Organisations, the voluntary sector, for example, the Royal Society for Nature Conservation (The Wildlife Trust Partnership), the Royal Society for the Protection of Birds and the National Trust are extremely important and influential.

Local Authorities have a remit to ensure that conservation interests are taken into full account and expressed in local and regional plans.

Ministry of Agriculture, Fisheries and Food (MAFF) promote a package of measures which aim to encourage farmers to undertake a range of positive actions designed to conserve and enhance the rural environment and its natural resources.

5.11 FISHERIES

5.11.1 General

The water environment can be said to be "used" by fish as a habitat. Fish use the coastal waters and river systems for food and shelter and are managed by man for both commercial and recreational purposes. Fish populations are affected both by the quality and the quantity of water, and by the physical suitability and structure of the aquatic ecosystem. The presence of a thriving fish stock is therefore one of the best possible indicators of a satisfactory water environment.

5.11.2 Commercial use of the fishery

Extensive use is made of the fisheries within Great Britain for commercial gain. This includes fish farming activities - the rearing of Rainbow Trout for human consumption and for sporting use, commercial eel fishing, shellfish harvesting, and marine fishing.

Fish farming can make a significant contribution to the rural economy, but is subject to stringent water abstraction and discharge controls. Protection is needed from any deterioration in water quality and quantity which could damage or impair the health of farms and stock and cause commercial damage

5.11.2.1 Local Perspective

There is only one important trout farm in the Plan area, situated at Horn Mill on the North Brook, a tributary of the Gwash which flows into Rutland Water. A major constraint on the development of more fish farms is the short supply of both spring and surface water suitable for fish farming. Some cage rearing is practised at a number of gravel pit trout fisheries in the area, but this on a relatively small scale.

Carp rearing is carried out at Cottingham, in ponds very close to the River Welland. Unlike trout, large amounts of water are not required to cultivate carp, nor has water quality to be so good.

Offshore, in the Wash, eels are caught primarily by trawling, often by boats operating in pairs. The inshore fishery makes extensive use of fyke nets. Many local waters are leased to commercial eel fishermen who can make a reasonable living by selling live eels. The eel fishery on the Welland is owned by the Agency.

5.11.3 Recreational use of the fishery

Angling is said to be the most popular recreational activity, in terms of participating numbers, within Britain. It is undertaken both for relaxation purposes and as a sport as coarse and game fishing.

Angling is practised on freshwater rivers, lakes and reservoirs and to a limited degree in coastal waters. It is practised on privately owned, syndicated waters and on club waters, managed by Angling Associations. No waters are freely available to the public.

The majority of anglers are interested in the pursuit of coarse fish, such as bream, carp, roach, perch, pike and tench. Fly fishing for trout is perhaps the most widespread and distinctive specialist category. Competitive match fishing is widely practised, although for the most part angling is non competitive in nature.

5.11.3.1 Local perspective

The Welland is a typical East Anglian river and its fish populations are influenced by the surrounding geography. From its source upstream of Market Harborough to below Stamford, angling is for chub, dace and roach. Some trout fishing is practised on streams such as the Eyebrook and the River Gwash (all the tributaries of the Welland hold populations of native brown trout).

The Welland below Tallington is an important venue for match fishing and the main species sought are bream, roach, and pike.

There are a number of still water coarse and trout fisheries in the catchment. Usually the still water coarse fisheries are flooded gravel pits, Tallington lakes being a good example. Both Rutland Water and Eyebrook reservoirs are used as trout fisheries. There are other smaller trout fisheries in the area such as the White House Fishery at Baston.

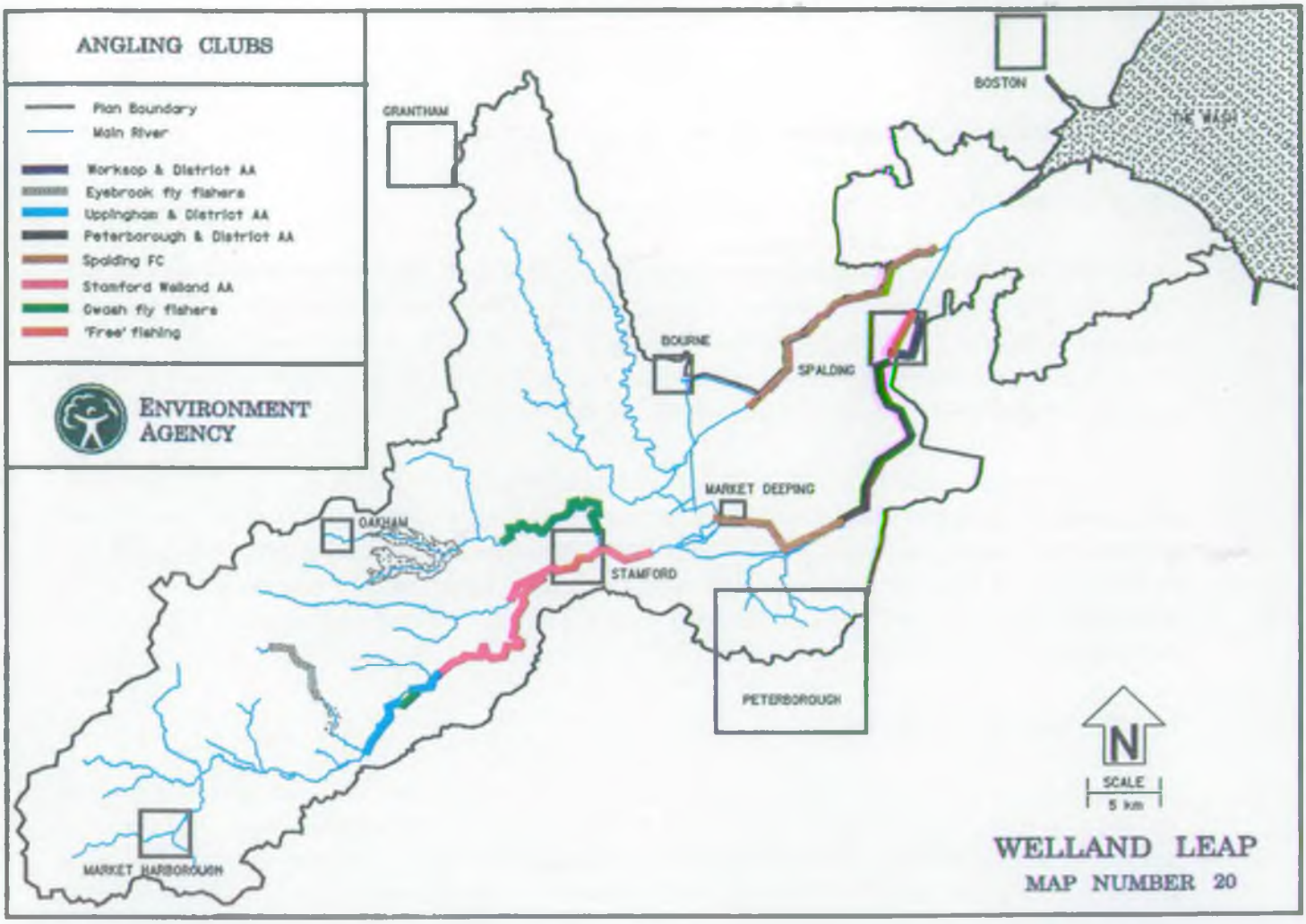
5.11.4 Role of Key Players

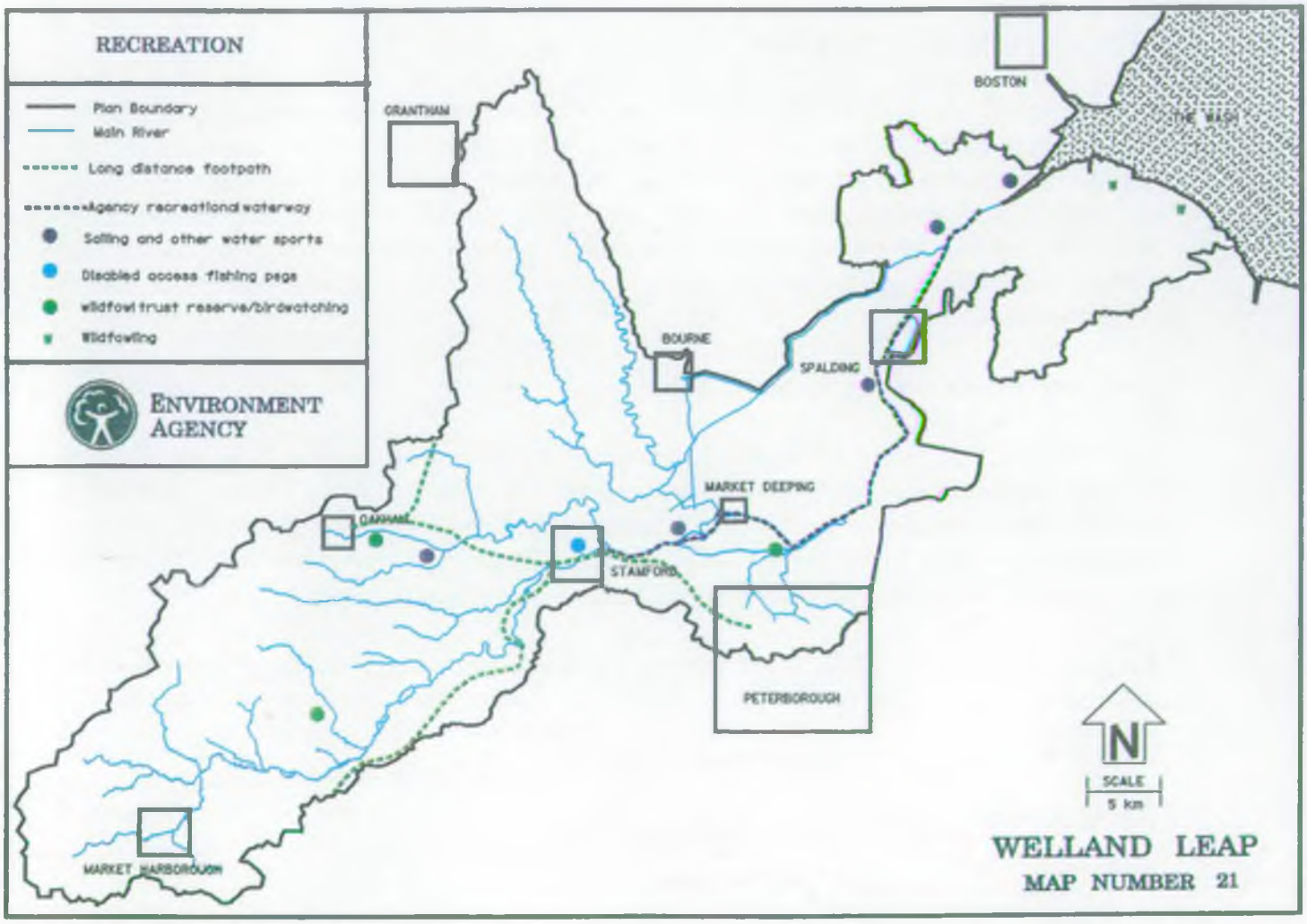
The Agency has responsibility for salmon and freshwater fisheries in England and Wales. We have a statutory duty to 'maintain, improve and develop such fisheries.

We make Byelaws regulating salmon and freshwater fisheries under the Water Resources Act 1991. These have to be confirmed by the Minister of Agriculture, Fisheries and Food or the Secretary of State for Wales before they can take effect. Ministers are also responsible for approving changes to fishing licence duties in cases where these attract formal objections.

Fishery enforcement is carried out by our team of enforcement officers and honorary bailiffs, who monitor rod licences and fish movements.

Map No. 20 shows angling clubs in the Plan area.


ANGLING CLUBS
Plan Boundary
Main River
Worksop & District AA
Eyebrook fly fishers
Uppingham & District AA
Peterborough & District AA
Spalding FC
Stamford Welland AA
Owash fly fishers
'Free' fishing
ENVIRONMENT AGENCY
BOSTON
THE WASH
GRANTHAM
BOURNE
SPALDING
MARKET DEEPING
OAKHAM
STAMFORD
PETERBOROUGH
MARKET HARBOROUGH
N
SCALE
5 km
WELLAND LEAP
MAP NUMBER 20


RECREATION
Plan Boundary
Main River
Long distance footpath
Agency recreational waterway
Sailing and other water sports
Disabled access fishing pegs
wildfowl trust reserve/birdwatching
Wildfowling
ENVIRONMENT AGENCY
BOSTON
THE WASH
GRANTHAM
BOURNE
SPALDING
MARKET DEEPING
OAKHAM
STAMFORD
PETERBOROUGH
MARKET HARBOROUGH
N
SCALE
5 km
WELLAND LEAP
MAP NUMBER 21

5.12 RECREATION AND AMENITY

5.12.1 General

As the role of the Agency in recreation and amenity is constrained by its remit, this use will focus upon those activities associated with our operational and regulatory duties. The range of activities included in this section include those such as walking, horse riding and tourism on sites of interest within the water environment and on land owned by ourselves as well as those activities traditionally thought of as sports or outdoor pursuits.

The increase in personal leisure time has increased peoples participation in, and expectations of this amenity. At the same time the countryside and river corridors are being used more intensively by developers and farmers with constraints and limitations upon access becoming more and more evident. The conflicts which can arise from the different demands between different user groups and those of landowners and tenants, makes management of recreational and amenity needs difficult.

5.12.2 Local perspective

The amount of recreation within the Welland catchment is relatively low especially when compared with the use of the nearby Nene. Exceptions to this are Rutland Water and the river corridor in Stamford which are heavily used, particularly during the summer months. Although informal recreation takes place throughout the rest of the catchment, it is at a much lower level and is regulated by access restrictions and a lack of facilities.

Walking, Cycling & Horse riding

The river corridors are crossed by a wide variety of public paths. As expected, certain routes are more heavily used than others, particularly those near urban areas. There are a number of long distance footpaths crossing the area notably the Torpel Way, the Viking Way and the Macmillan Way; these do however, mostly follow the higher ground. There are several areas of Countryside Stewardship alongside the rivers which provide much needed access to the river corridor. Recreational paths are scarce in the lower parts of the catchment partly due to its history as fenland.

Navigation, Canoeing and Sailing

The lower end of the rivers Welland and Glen are designated as Recreational Waterways. These are licensed public navigations controlled by ourselves. Members of the British Canoe Union are automatically licensed to use this navigation. All other boat users and canoeists require a separate licence according to the type of vessel. The Welland downstream of Stamford is used each winter for a tour by canoeists from the East Midlands Region.

Sailing takes place on Rutland Water and gravel pits alongside the rivers. There is also a sailing club at Spalding based on the Welland. This club possesses the only slipway on the non- tidal

Welland. A small number of sea going sailing craft use the outfall channel of the River Glen in which to moor.

Birdwatching

Both Rutland Water and the Wash are internationally known for their birdlife attracting visitors from all over the UK. Both are Ramsar sites and the Wash has been proposed as a Special Area for Conservation. The nature reserves at Baston, on the R. Glen, also attract a wide variety of wetland birds and are a popular venue for bird watching in winter and spring.

5.12.3 Role of Key Players

We have an important role to play in partnership with others in developing policies, management techniques and in the provision of facilities which will achieve a sustainable and integrated approach to the use of waters and land for recreation.

In addition to ourselves, there are many other bodies and organisations which have a role to play an improving the uses of recreation and amenity. Local Authorities, the Countryside Commission and the Sports Council all have important duties in this respect.

Map No 21 shows Recreational activities in the Plan area.

5.13 RADIOACTIVE SUBSTANCES

5.13.1 General

Radioactive substances are present in the environment as a result of both natural processes and of man's activities. The uncontrolled and incautious use of these substances can pose both immediate and long term hazards.

The range of premises using radioactivity is large and includes hospitals, universities, research establishments and many different commercial industries, amongst them the various components of the nuclear industry. The types of waste are equally diverse. They include wastes with very low levels of radioactivity from industry and commerce and wastes with intermediate and high levels of radioactivity generated by the nuclear industry. The approach of the Agency is an integrated one, considering releases to the environment as a whole.

The usage and disposal of radioactivity is grouped by The Radioactive Substances Act '93 into three categories:

Section 7 covers the registration of premises where radioactive sources may be held and used;

Section 10 covers the registration of mobile sources, where the Operator is permitted to take radioactive sources around in the course of his work (viz measuring devices for road laying and agricultural machinery);

Section 13 covers the disposal of radioactive sources, whether to air, the aquatic environment, landfill, or specified depositories.

5.13.2 Local Perspective

Within the area covered by this Plan, the Agency regulates 16 Section 7 registrations and 14 Section 10 registrations. Exemption orders made under the Act permit the holding and disposal of radioactivity where the usage is widespread and the quantities involved are of such low magnitude as not to present any risk to the public or the environment.

5.13.3 The Role of Key Players

Our role in respect of the categories identified above is as follows:

Section 7 — We are concerned to ensure that the holding is properly recorded and supervised, and that correct procedures are in place for ensuring the safe replacement/disposal at the end of the useful life of the sources;

Section 10 — We are concerned to ensure that the holding, transportation, and storage when not in use, is properly recorded and controlled, and that correct

procedures are in place for ensuring the safe replacement/disposal at the end of the useful life of the sources;

Section 13 We are concerned to ensure that proper assessments of the impact on the environment are carried out to ensure that the disposal may be carried out in such a way as to prevent harm to humans or to the environment, and that the disposals conform to the approved methods.

The National Radiological Board also play a role in radiation protection for the public. The Nuclear Installation Inspectorate part of the Health and Safey Executive have responsibilty for safety at nuclear power stations.

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6.0 STATE OF THE ENVIRONMENT

This section of the report sets out a range of environmental indicators that are used to measure the health of the environment in terms of the Air, Water, Land and Wildlife. It identifies the prescribed standards for these which will enable the wellbeing of our natural resources to be maintained and where possible enhanced. It also sets out the level of monitoring undertaken by ourselves and summarises the current state of the environment in terms of each indicator.

We are using this approach to provide data to others, such as local authorities with whom we work closely and to inform others about environmental matters. Supporting data is available within the appendices.

6.1 SURFACE WATER QUALITY

General

Our aim for surface water quality across England and Wales is to achieve a continuing overall improvement in the quality of rivers, estuaries and coastal waters, through the control of pollution.

6.1.1 Chemical Water Quality

6.1.1.1 Monitoring

Much of our effort to maintain and improve water quality is based upon data gathered as part of our ongoing monitoring routine. We collect samples from a network of sites throughout the Plan area at regular intervals for statutory and classification purposes. We also take samples to fulfil operational needs, for example following pollution incidents or for special surveys. Samples from sediments are also collected, mainly for the Dangerous Substances (76/464/EEC and associated 'daughter') Directive.

6.1.1.2 Targets

We set Water Quality Objectives (WQO) to provide a consistent basis for planning and managing water quality.

WQOs establish a defined level of protection for aquatic life and other uses. Achieving the specific water quality standards associated with these objectives will help sustain the use of rivers for recreation, fisheries and wildlife, and protect the interests of abstractors. WQOs also provide a basis for setting consents to discharge effluents into rivers, and guide decisions on the Agency's other actions to control and prevent pollution.

WQOs originate from a variety of sources, eg. EC Directive, National and Local Schemes. Many EC Directive WQOs are statutory. The Department of the Environment (DoE) has published proposals for a National Scheme of Statutory Water Quality Objectives (SWQOs) for classified river stretches. However, until these are formally established they will be applied on a non-statutory basis. Criteria used to define which river stretches are classified include river flow, position of tributaries and discharges.

The Water Quality Objectives (WQO) scheme

The DoE proposed WQO Scheme for freshwater reflects a variety of different river uses.
The River Ecosystem (RE) Scheme comprises five classes which reflect the chemical quality requirements of communities of plants and animals occurring in our rivers. The standards defining these classes reflect differing degrees of pollution by organic matter and other common pollutants which impact upon flora and fauna (in the future, the RE Scheme will be augmented by schemes proposed for other recognised uses including: abstraction for drinking water supply; agricultural abstraction; industrial abstraction; special ecosystem; and watersports).

Table 3: Descriptions of the River Ecosystem Classes

Class RE1	Water of very good quality suitable for all fish species
Class RE2	Water of good quality suitable for all fish species
Class RE3	Water of fair quality suitable for high class coarse fish populations
Class RE4	Water of fair quality suitable for coarse fish populations
Class RE5	Water of poor quality that is likely to limit coarse fish populations
Unclassified	Water of bad quality in which fish are unlikely to be present or insufficient data available by which to classify water quality

Chemical standards have been derived for each of these classes and details of these standards are given in ***Appendix 5.***

The long-term WQOs for the Plan area are given in **Appendix 6**. These have been set according to the current and potential future uses of the watercourses in the catchment, and represent what we perceive as realistic and sustainable targets for the future. For those watercourses which are classified, these objectives will form the basis for future SWQOs.

It is important that long-term objectives reflect the likely uses of the watercourses in the area and a public view on the potential uses for specific watercourses would be valued.

Statutory Water Quality Standards under EC Directives

The EC Dangerous Substances Directive (76/464/EEC) - to monitor Dangerous Substances in watercourses downstream of known discharge points **(Appendix 7)**.

The EC Surface Water Abstraction Directive (75/440/EEC) - to monitor the quality of water abstracted for Public Water Supply

EC Fisheries Directive (78/659/EEC) - to monitor the presence of substances detrimental to fish populations **(Appendix 8)**.

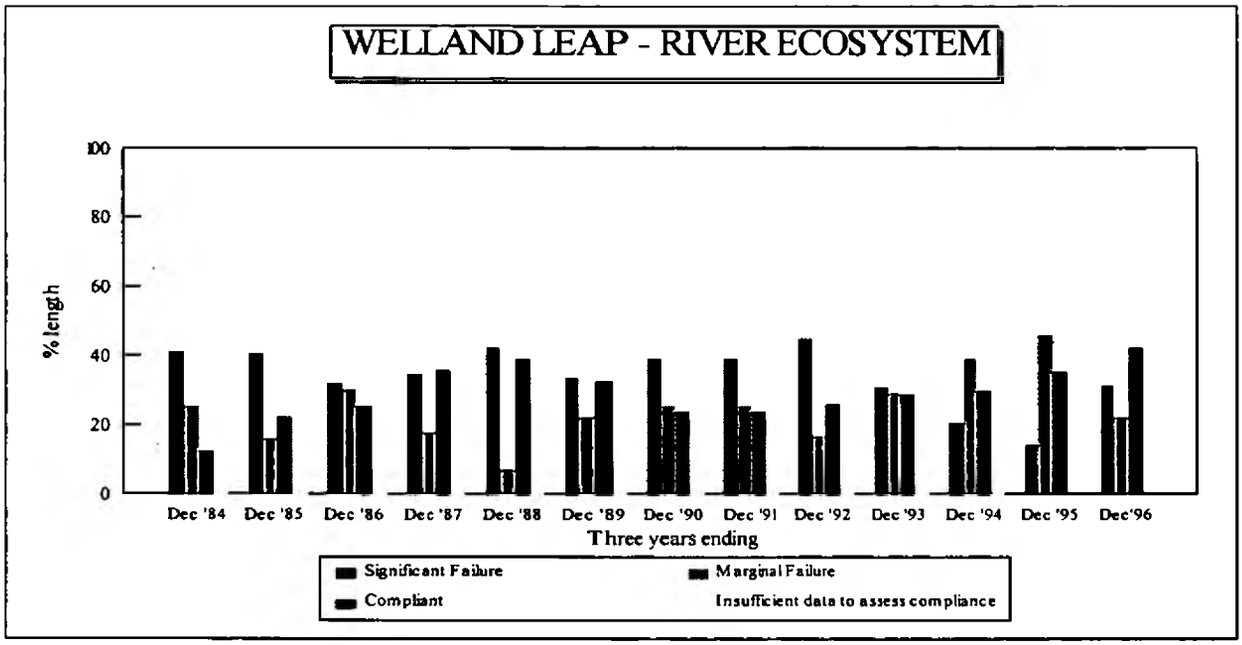
6.1.1.3 Current status/trends

Compliance against the WQO scheme

Compliance with these objectives is assessed using routine monitoring results from a rolling three year period. Stretches are described as compliant or showing significant or marginal failure.

Map No.7, shows Compliance with the Proposed Long Term Objectives for the period ending September 1996, along with Proposed Long and Short Term Objectives.

Significant influences on water quality are effluent quality and the available water resource for diluting effluent. A review of RE compliance over the last fifteen years has generally shown a steady improvement as illustrated below.



It is important to realise that this is a national scheme and thus is designed to reflect the natural quality of a range of rivers from fast flowing upland rivers, through high quality lowland rivers to the slow flowing managed rivers typical of Eastern England. Thus the particularly demanding requirements for dissolved oxygen of the highest (RE1) class may not be achievable in the slower flowing rivers found in this Plan area due to natural in-stream biological processes.

Shortfalls against WQO Scheme

Shortfalls exist where stretches are identified as having failed significantly or marginally. Details of significant failures for the three years ending September 1996 are given below.

Marginal failures in water quality are where we are statistically uncertain of whether a failure really exists. Where such failures are recorded the situation will continue to be monitored and reviewed. Additional monitoring may be introduced to improve our understanding of the situation. See **Appendix 9** for details of marginal failures.

(i) *Grand Union Canal. (Husband Bosworth to Foxton, Foxton to Market Harborough and Foxton to Saddington).* A review of chemical data from the last 15 years demonstrates that these stretches have always failed their BOD and DO objectives, either marginally or sometimes significantly, since 1992. **(Issue 15)**. Although the chemical quality of this watercourse suffers, it does not appear to harm the biological quality, which is very good.

(ii) *River Welland. Headwaters to Ashley Dyke.* The upper reaches of this stretch have suffered from low flows for several years (drought) resulting in raised BOD concentrations and lowered DO concentrations (see Water Resources Section & **Issue 15**).

Further downstream the effects of urban run-off exacerbate the problem. That is rainwater washing off roads and industrial areas in Market Harborough. One surface water outlet in particular, known as the 'CO-OP. SWS.', has been identified as requiring improvement by AWS Limited. **(Issue 15).**

(iii) *River Welland. Folly River to Tidal Limit.* This section of the river suffers from the effects of eutrophication and algal blooms. Algal action is directly responsible for the failure against pH objectives in this stretch. **(Issue 10).**

(iv) *Thurlby Main Drain.* Chemical analysis of Thurlby Main Drain shows high concentrations of ammonia. Ammonia leaches from the surrounding peat soils during periods of wet weather. Although the chemical quality of this watercourse suffers, the biological quality is excellent. **(Issue 15).**

(v) *Whaplode River. (Holbeach to Tidal Welland).* This stretch has consistently failed the RE target for BOD. However, a major investment programme to improve effluent quality was completed at the food processing firm Tinsleys in the summer of 1994. The effluent treatment plant is now producing a consistently high quality discharge and water quality in the river is also improving. **(Issue 15** and **Appendix 3).**

(vi) *North Brook. Exton arm to R. Gwash.* Prior to 1993 this stretch complied with its RE1 target. Since then, BOD has failed significantly & DO marginally. The stretch currently complies with RE4 **(Issue15).**

Short-term Objectives set under the WQO Scheme

In preparation for SWQOs, for some river stretches in our Consultation Document long-term objectives are supplemented by short-term objectives. These are adopted where water quality fails to meet the long-term objective, where further investigation may be required to assess the nature of the problem or where there are no immediate solutions.

In these cases a target date for achieving the long-term objective may be set. Costs of schemes to meet long-term WQOs will be considered against the likely benefits. This should ensure excessive costs are not incurred by dischargers and improvements are effectively targeted. More details of our proposals for short-term objectives are outlined in **Appendices 3** and **6.**

Compliance against SWQOs under EC Directives

Compliance is assessed against the relevant standards, at designated sites, and reported to the DoE on a calendar year basis.

Map No. 22 shows Compliance against EC Directives

Dangerous Substances Directive - all points designated in the Plan area under this Directive have been compliant since 1992.

Freshwater Fish Directive - Some failures have been recorded in the Plan area against standards for this Directive. These are shown in **Table 4.**

Table 4: Freshwater Fish Directive failures

River	Designation	Failures (1992- 1995)
CHATER, MORCOTT ARM - R WELLAND	SALMONID	TOTAL AMMONIA 1994
WELLAND, TINWELL -TIDAL LIMIT	CYPRINID	pH 1992 & 1995

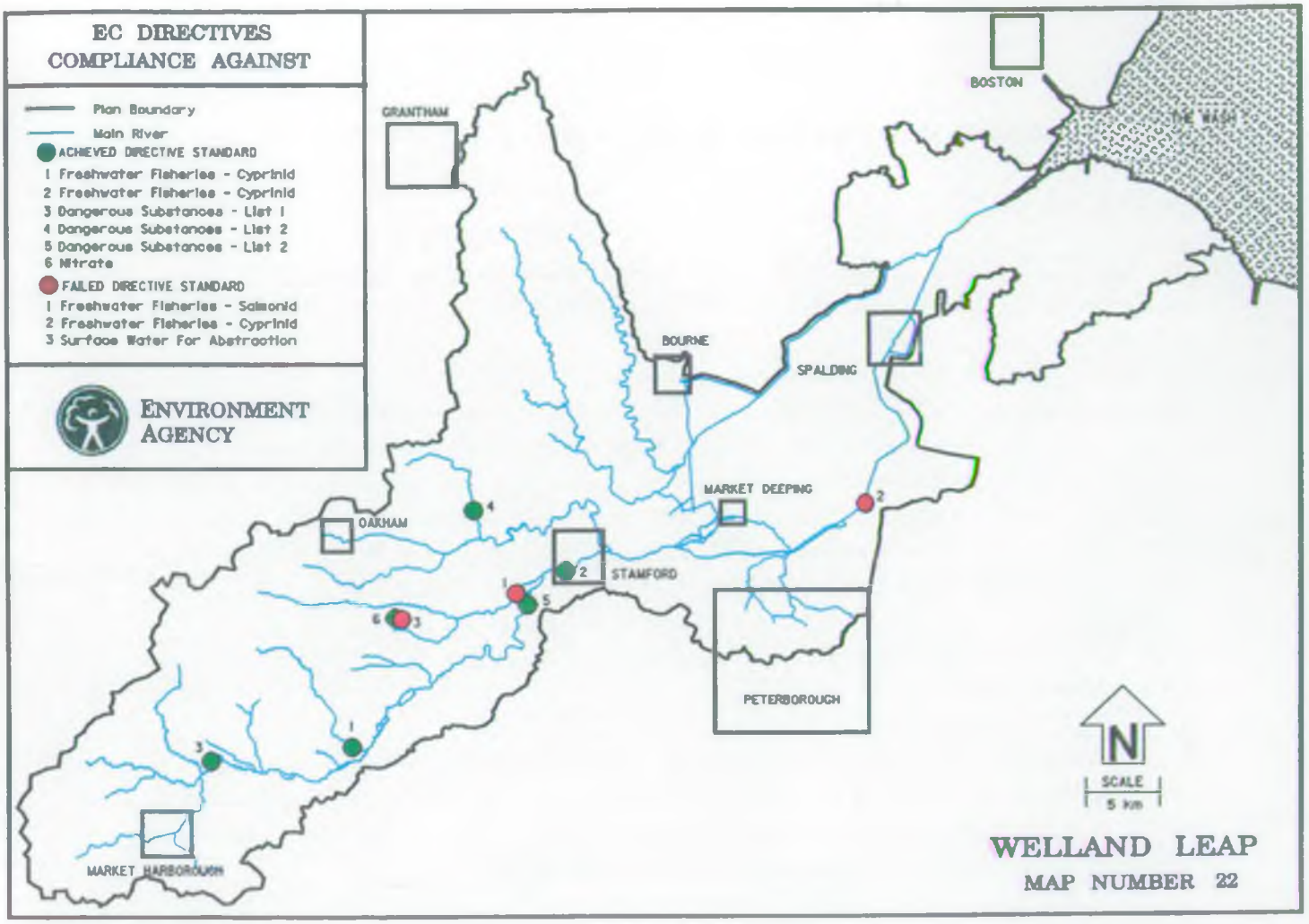
The reasons for these failures have been investigated. The River Chater failure was attributed to a single, unexplained failing sampling. There were no reported problems in the river at the time. The pH failures on the River Welland are thought to be associated with summer algal activity (See **Issue 10**).

Surface Water Abstraction Directive -There is one abstraction point used for public water supply within the Plan area at Wing Water Treatment Works for which compliance has not been always achieved. Details are shown in **Table 5.**

Table 5: Surface Water Abstraction Directive failures

Location	Source of water	Failures (1992-1995)
WING WATER TREATMENT WORKS	RUTLAND WATER	PHENOLS 1994 (ANALYTICAL DIFFICULTIES)

It should be noted that the apparent phenols failures are believed to be due to analytical difficulties.


EC DIRECTIVES
COMPLIANCE AGAINST
Plan Boundary
Main River
ACHIEVED DIRECTIVE STANDARD
1 Freshwater Fisheries - Cyprinid
2 Freshwater Fisheries - Cyprinid
3 Dangerous Substances - List 1
4 Dangerous Substances - List 2
5 Dangerous Substances - List 2
6 Nitrate
FAILED DIRECTIVE STANDARD
1 Freshwater Fisheries - Salmonid
2 Freshwater Fisheries - Cyprinid
3 Surface Water For Abstraction
ENVIRONMENT AGENCY
BOSTON
GRANTHAM
BOURNE
SPALDING
MARKET DEEPING
OAKHAM
STAMFORD
PETERBOROUGH
MARKET HARBOROUGH
N
SCALE
5 km
WELLAND LEAP
MAP NUMBER 22

6.1.2 Biological Water Quality (Freshwater Invertebrates)

6.1.2.1 General

The monitoring of biological life within watercourses gives us an indication of both their conservation value and of the quality of river water. Such monitoring complements our chemical analysis of river water.

Biological assessment is based upon the monitoring of aquatic macroinvertebrates living in rivers. They do not move far and respond to everything contained in the water. They can be affected by pollutants which occur intermittently or in very low concentrations. If the water is polluted, even for only a few minutes then some or all of them may die. Recovery of the community may take several months. This means that biology provides evidence of pollution which may have been missed by the routine spot-checks which form the basis of the chemical monitoring.

6.1.2.2 Monitoring

For our General Quality Assessment (GQA) surveys (see **Appendix 1**), each chemical point, representing one or more river stretches was matched with a unique biology sampling point where possible. Biological samples are collected twice from each site in a year (Spring and Autumn). Biological samples are also taken at other sampling sites.

6.1.2.3 Targets

Some animals are more susceptible than others to pollution and the presence of sensitive organisms is a sign that water quality is good. This is taken into account by the Biological Monitoring Working Party (BMWP) scheme. A family (or taxon) of macroinvertebrates sensitive to organic pollution scores more highly (10 points) than one which tolerates pollution (1 point). The BMWP score for a sample is the sum of the points for each family found in a sample. The Average Score per Taxon (ASPT) is calculated by dividing the BMWP score by the number of scoring taxa present.

A national Biological GQA classification system has been developed. Since rivers vary in size, flow, geology and topography, the macroinvertebrates present vary even when pollution is absent. It is, therefore, useful to describe the biology as a shortfall from that expected in the absence of pollution. A computer system called RIVPACS (River InVertebrate Prediction And Classification System) is used to predict the macroinvertebrates which should be found in a clean river. For each site RIVPACS is used to predict the number of taxa and the ASPT. The biological quality is then expressed as the ratio of the prediction and actual scores. Such a ratio is called an Ecological Quality Index (EQI). The Biological GQA grades are based on the EQI values in **Table 6** below.

Table 6: Biological GQA Grades

Biological GQA Grades		
Grade	**EQI for ASPT**	**EQI for Taxa**
a	1.0	0.85
b	0.90	0.70
c	0.77	0.55
d	0.65	0.45
e	0.50	0.30
f	-	-

This system enables the Agency to describe water quality in a nationally consistent manner and assess whether changes in quality are statistically significant.

The biological data also enables an assessment of the conservation value of a river stretch. Macroinvertebrate communities which have a high diversity of species and/or rarity value are considered to be of conservation importance. A methodology has been devised to summarise this information for presentation in the form of a Community Conservation Index.

Anglian Region also has use-related targets for assessing biological quality - Lincoln Quality Index (LQI). Ranges of BMWP score and ASPTs have been assigned a rank of 1 to 7 based on whether the habitat for macroinvertebrates is considered to be rich or poor. The LQI is the average of the two ranks. The LQI system, ranges from A++ (Excellent) to I (Very Poor). Biological sampling sites have been assigned an LQI target based on the identified use of the river stretch. LQI scores are compared against this target and a failure is identified where a site persistently fails or significantly fails to meet its target. The Agency responds to failures by carrying out further investigation to identify the cause of the failure.

6.1.2.4 Current State

Map No. 4 shows the Biological quality of watercourses in the Plan area.

Water quality, as indicated by resident macroinvertebrate communities, is generally very good throughout the catchment, with significant and sustained improvements evident in some stretches over recent years, for example, the upper Welland in the Weston/Medbourne/Rockingham area.

Table 7: Freshwater macroinvertebrate species of high conservation status

SPECIES	STATUS	LOCATION	COMMENTS
Austropotamobius pallipes (White-clawed Crayfish)	Protected by UK/EC law. Regionally notable.	R.Welland, R. Chater, R.Gwash.	See Issue 7
Hydropsyche saxonica (Caseless caddisfly)	Red Data Book 1 (endangered) -to be reviewed	Eyebrook, Upper Langton Brook.	Generally inhabits clean, fast-flowing stony streams. Once considered extremely rare in U.K.. More widespread now, but still a national rarity and always in low numbers where found.
Aphelocheirus aestivalis (Saucer bug)	Regionally notable.	R.Welland (Deeping channel).	See Issue 8
Platycnemis pennipes (White-legged damselfly)	Regionally notable.	Grand Union Canal (Foxton Arm).	Species restricted to Southern half of England & Wales, so that region is on extreme northern limit of distribution. Spreading North and East since late 1980s.
Athripsodes bilineatus (Cased caddisfly)	Local (restricted distribution).	R.Gwash.	Inhabits stony streams & lakeshores. Vulnerable to deteriorating water quality.
Silo nigricornis (Cased caddisfly)	Local (restricted distribution)	North Brook.	Inhabits calcareous stony rivers & streams, particularly in South-East England (significantly rarer to North). Vulnerable to deteriorating water quality.
Nemurella picteti (Stonefly)	Regionally notable	North Brook.	Nationally, a common species, but rare in lowland Eastern England because of a preference for high altitudes (the species tends to inhabit water of a sustained low temperature).

The Plan area includes a number of protected, locally or nationally important wetland sites (Nature Reserves, SSSI's, etc.), such as Baston Fen, the Cross Drain and Thurlby Fen Slipe, which support highly diverse and unusual communities of macroinvertebrates.

These include several rarities, for example, the nationally rare Valve Snail (*Valvata macrostoma*) has been recorded from Baston Fen, and a number of rare or unusual beetles, bugs and dragonflies are present at all three sites (*eg.* the Ruddy Darter dragonfly, *Sympetrum sanguineum* and Water Stick Insect, *Ranatra linearis* in the fen sites and nearby drains, and the diving beetle,

Agabus undulatus in the Cross Drain). Such sites also support unusual and important plant communities.

Rutland Water, an internationally important wetland site, is, of course, also included in the Plan area.

Shortfalls in Biological Quality

(i) *Upper R. Welland/R. Jordan, Market Harborough area.* Surface runoff and industrial effluents both contribute to a reduction in water quality. Two principal problems related to industrial effluent (local mushroom farms) have recently been rectified and current data indicates a significant improvement in quality throughout the stretch. A number of surface water discharges remain, however, and work to ameliorate these is ongoing (**Appendix 4**)

The headwaters of the R. Welland, further upstream, also support a relatively poor fauna. The reason for this is not known at present.

(ii) *North Gwash, downstream of Oakham.* Surface runoff from the town results in a poor quality macroinvertebrate fauna, inadequate for the designated quality target for the stretch. (**Appendix 4**)

(iii) *R. Gwash, downstream of Rutland Water.* Scour from the reservoir bed, including ferric floc resulting from dosing of the reservoir with ferric sulphate for algal bloom reduction, impacts on the invertebrate fauna in this stretch.

(iv) *Lower East Glen, near Braceborough.* Septic tank effluent entering the river via a common surface drain results in a significant impact on the invertebrate fauna, exacerbated by low summer flows. This impact is detectable downstream to Kate's Bridge, and sometimes beyond, dependant on relative flows of the East and West rivers. This matter is also reflected in the water quality section (**Issue 9**).

(v) *Whaplode (Holbeach) River, downstream of Tinsley's Foods.* Food processing waste has, for some years, had a significant impact on the macroinvertebrate fauna in this stretch. Installation of effluent treatment systems by the company has resulted in substantial improvements, but the fauna still occasionally fails to achieve the required standard. Further improvements are expected, however, and the situation will continue to be regularly monitored.

6.1.2.5 Trends

Concomitant with regional & national trends, water quality in the Welland catchment, indicated by resident macroinvertebrate communities, has generally improved since the early 1990's, allowing for constraints imposed by low summer flows. Some of the above areas of concern (specifically, the R. Welland in Mkt. Harborough and North Gwash) have significantly improved through 1995/96. Future improvements are also likely in the Whaplode (Holbeach) River.

6.1.2.6 Available data

An extensive database is held by the Northern Area of Anglian Region, including full species lists for 155 sites in the Welland catchment, sampled up to three times per year. Data is available from early 1989 to the present, and as paper records back to the 1970's. This data is also held by the Principal Biologist in the regional office, and can be used with the RIVPACS system for prediction and classification. Biological GQA data (classes related to river stretches) are available from this source. Sample analysis is undertaken in conjunction with rigorous quality assurance procedures.

6.1.3 Chemical and Biological Water Quality - summary

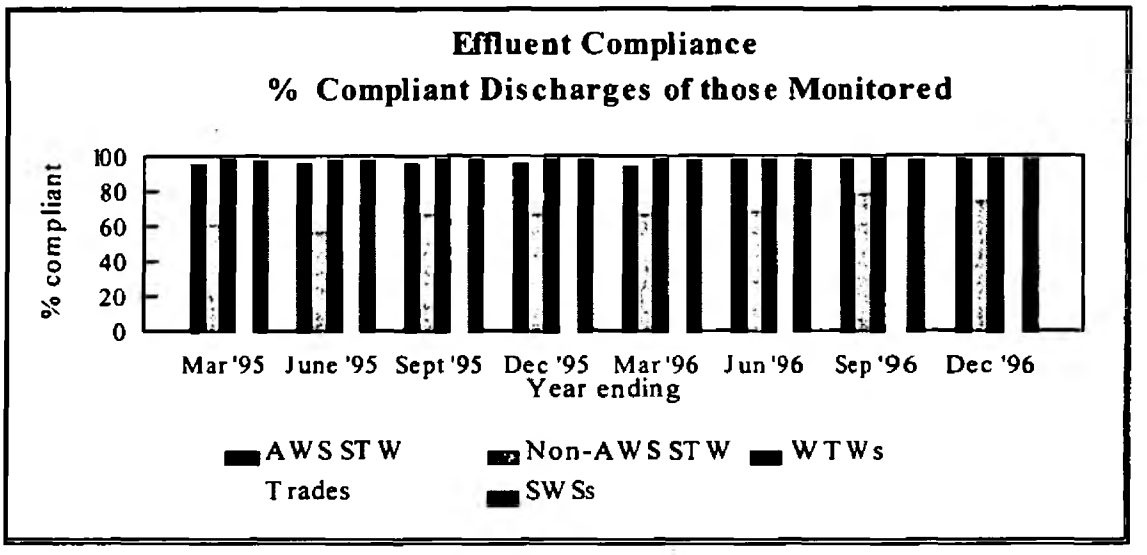
Table 8: Watercourses in the Plan area with chemical and/or biological shortfalls

WATERCOURSE	CHEMICAL	BIOLOGICAL
Grand Union Canal (Issue 10)	Significant BOD and DO failure	Very good
R Welland, Headwaters - Ashley Dyke (Issue 15)	Significant BOD and DO failure	Poor fauna.
R Welland, Folly River - Tidal Limit (Issue 10)	Significant pH failure	Good. However note that there is excessive growth of filamentous algae. Remedial action, using barley straw, was introduced in 1995 to reduce algal growth.
Thurlby Main Drain (Issue 15)	Significant ammonia failure	Very good
Whaplode River, Tinsleys - Tidal Welland	Significant BOD failure	Occasionally fails to meet target
North Brook, Exton Arm - R Gwash (Issue 15)	Significant BOD failure	Very good
North Gwash, downstream of Oakham (Issue X)	Compliant	Poor
R Gwash, downstream of Rutland (Issue 4)	Marginal DO failure	Fauna impacted by scour from reservoir
Lower East Glen, Braceborough - Kates Bridge (Issue 9)	Marginal BOD and DO failure	Septic tank effluent entering river often results in significant faunal impact.

Other Indicators of Water Quality Status/Trends

Other indicators of water quality include (i) the Performance of Discharges against Consent Conditions and (ii) reported pollution incidents.

Discharge Performance Compliance of monitored discharges in the Plan Area, for the year ending December 1996, is summarised below.



Note: There are a few points that it is important to note. Firstly, direct comparisons should not be made between different types of discharge. This is because different types of standards, with varying legal definitions of compliance, are applied to different types of discharge. Secondly, because the number of discharges monitored is small, big changes in the statistics may be due to one or two discharges moving from compliance to non-compliance, or vice versa, from one reporting period to the next.

We are currently targeting categories of discharge showing poor compliance.

Overperforming STWs

Historically some discharges have consents that are less stringent than those required by modern day standards. We are progressively reviewing these discharges, for example the discharge to the Whaplode River, where investment by the discharger was secured.

Several of the major STWs in the Plan area are currently operating to a better standard than that required by their Legal Consent (in terms of volume discharged and/or quality of effluent). The risk of deterioration in discharge performance of these STWs is considered to be low, provided that current operational practice continues and only modest population growth occurs within the sewerage catchment areas served by them.

Our assessment of water quality suggests that the greatest risk to water quality is downstream of Market Harborough STW (examples of other such discharges are given in **Appendix 10**).

The watercourses downstream of Market Harborough STW which currently achieve their WQOs, but which may fail to do so in the future are given below.

Table 9: Proposed short term RE targets downstream of Market Harborough

River	Stretch	Proposed short-term RE target	Sewage Works
Welland	Market Harborough STW...Eye Brook (1)	RE4	Market Harborough
Welland	Market Harborough STW...Eye Brook (2)	RE4	Market Harborough
Welland	Market Harborough STW...Eye Brook (3)	RE4	Market Harborough

In the interim short-term objectives will be applied until investment is able to underpin performance **(Appendices 3 and 6)**

Smaller STWs and Septic Tanks

Many of the smaller villages within the plan area have inadequate sewage disposal systems, which manifest themselves in terms of localised pollution problems. These affects are made worse by dry weather and low dilution flows **(See Issue 9).**

Several of these problem areas are currently being addressed by AWS (see **Appendix 4** for details).

Intermittent Discharges from Sewerage systems

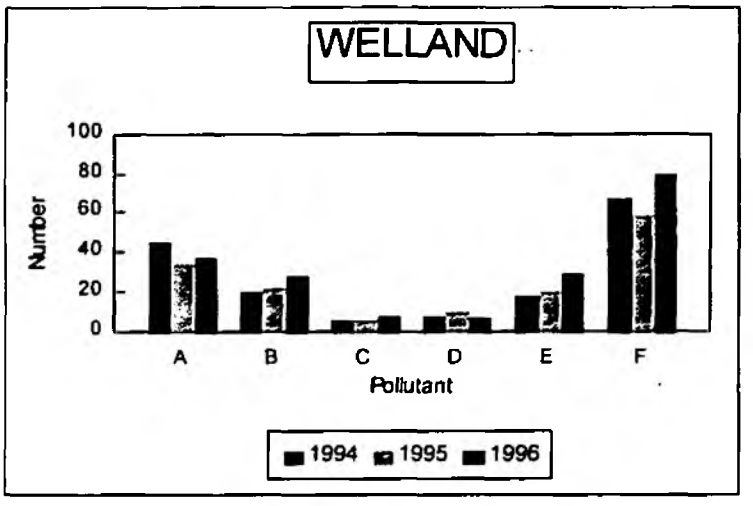
Intermittent discharges from emergency and storm overflows occur from time to time from AWS sewerage systems, this facility is necessary in order to prevent flooding due to breakdown at a sewage pumping station or during high rainfall events.

There are however a number of unsatisfactory discharges of this nature within the Plan area which cause localised pollution and have been identified for improvement by AWS as part of the Second Asset Management Plan (AMP2) process (see **Appendix 4**).

Water Pollution Incidents

In England and Wales there were 35,891 reported pollution incidents in 1995, of these 23,463 were substantiated. The National trend suggests an increase of over 27% since 1990, but this has been influenced by increased public awareness and the introduction of a freephone emergency hotline.

This trend is reflected in the figures for the plan area which show a 20% increase between 1991 and 1996. Within the Plan area most incidents are attributed to 'Oils'. A breakdown of incidents by type of pollution since 1994 is shown below.



Key:
A Oils
B Sewage
C Chemicals
D Organic Wastes
E Others
F No Pollution

6.1.4 Other water quality issues

6.1.4.1 Eutrophication

Eutrophication is the enrichment of water by nutrients, causing an accelerated growth of algae and higher forms of plant life to produce an undesirable disturbance to the balance of organisms present in the water and the quality of the water concerned. The key nutrient controlling eutrophication in freshwater is phosphate. The principal sources of this are from surface water run-off from agricultural land and sewage effluent discharges from STWs. The slow moving nature of watercourses in parts of the Plan Area also plays a major role (**Issue 10** and **Appendix 2**).

Under the Urban Waste Water Treatment Directive (UWWTD), waters identified as eutrophic can be designated as Sensitive Areas [Eutrophic] (SA[E]s). This means that nutrient controls are required for direct and indirect discharges, unless it can be shown that this will have no affect on eutrophic ation. The UWWTD only applies to discharges from STWs serving a population greater than 10,000; known as qualifying discharges. Rutland Water has already been designated as a Sensitive Area {Eutrophic}, and we are carrying out environmental assessments of both Rutland Water and other candidate Sensitive Areas [Eutrophic]. In 1997 we will be making a submission to DoE putting forward the River Welland as a candidate SA[E]).

6.1.4.2 Pesticides

Pesticide concentrations in ground and surface water in this Catchment are not considered to be a significant problem. An area of the Lincolnshire Limestone aquifer, between the Helpston landfill sites and the nearest major abstraction has become contaminated, particularly be the pesticide Mecoprop. This is being addressed by the Agency (see **Issue 11**).

6.1.4.3 Nitrates

General

Nitrate is a chemical of concern in the aquatic environment because of it's contribution to eutrophication in estuaries and it's presence in drinking water where it exceeds the maximum admissible limit for drinking water.

As 75% of all groundwater abstracted in England and Wales is public water supply, it is important to minimise nitrate leaching into aquifers. Agricultural activities are the principal source of nitrate leaching into groundwaters both from the mechanical action of ploughing, particularly of grassland areas and from the use of fertilizers.

A pilot scheme of 10 Nitrate Sensitive Areas (NSAs) was introduced in 1990 in order to test the effectiveness of agricultural measures taken to reduce nitrate leaching, for which annual payments were made to help restrict or change specific farming practices. In 1995 the pilot NSA scheme was subsequently re-launched to form a unified scheme of 32 areas.

All of the NSAs also fall within the Nitrate Vulnerable Zones (NVZs) which will be designated for the purposes of the *EC Nitrates Directive (91/676/EEC)*. These NVZs each require an action plan, in addition to general advice which, for England and Wales, is provided by way of the Code of Good Agricultural Practice for the Protection of Water, published by MAFF.

Monitoring

In the Welland catchment all drinking water is supplied by Anglian Water Services (AWS). AWS routinely monitor water entering public supply to ensure that it meets the EC Drinking water limit for nitrate. This data is passed to our national groundwater centre. In time such data will be accessible at all offices.

We monitor groundwater quality (at all locations) from analysis of samples taken at boreholes on the groundwater quality monitoring network. Nitrate concentrations are measured as part of a basic suite of analysis. Nitrate is usually measured as Total Oxidisable Nitrogen (TON).

The EC limit for nitrate in drinking water is 50 mg/l is equivalent to 11.3 mg/l TON. Surface waters are also monitored for nitrate concentrations. Data of high nitrate sources is abailable on request from oue Area office.

Targets

The Water Supply (Water Quality) Regulations (SI 1989 No 1147) sets out a maximum limit of 50 milligrammes per litre for drinking water.

Current status/trends

There are five major public water supply abstractions in the Welland catchment. Nitrate concentrations are not perceived to be high at these sources and consequently, in contrast to other catchments in Eastern England no land has been designated as a Nitrate Vulnerable Zone.

6.2 GROUNDWATER

6.2.1 General

A groundwater protection policy for England and Wales was published in 1992 by the former National Rivers Authority. Groundwater can be particularly vulnerable to pollution and if pollution occurs, remediation of groundwater can be extremely difficult to achieve. Vulnerability of groundwater is dependant on the nature of overlying soils, the geology and the depth to the water table.

About a third of the public water supply in England and Wales is derived from groundwaters and thus it is essential to protect this resource in a sustainable manner. Under Section 85 of the *Water Resources Act 1991* it is an offence to pollute groundwater. The *EC Groundwater Directive (80/68/EEC)* also requires that specific protection measures are taken for two categories of substances: (List I) which should be prevented from entering groundwater, and those (List II) which could have a harmful effect. In addition, for each potable groundwater source, source protection zones are in the process of being defined. There are three levels of protection forming approximately three concentric zones around sources. These are intended to guide planning and development around each source in order to minimise future risks of groundwater contamination at individual sites of abstraction.

6.2.2 Monitoring

Background groundwater quality is monitored as part of our groundwater quality monitoring network. In addition to data from our monitoring, data from public water supply boreholes will in time also be utilised. Where there are known pollution problems special investigations are carried out using a higher density of monitoring boreholes.

In Northern area, groundwater quality monitoring is focused on the major aquifers, both chalk and limestone. A recent review modified the monitoring so that there is a higher density of sampling locations on the aquifer outcrops compared to the confined part of the aquifer. This is so that there is more monitoring of groundwater quality where the aquifers are more vulnerable to pollution.

Monitoring frequency depends on the nature of the aquifer and is usually in the range of two, in the confined part of the aquifer, to four times per year for boreholes on the aquifer outcrops. The substances typically analysed are major anions and cations including chloride and Total Oxidisable Nitrogen (TON). In future samples will be analysed for an extended suite of determinands so that the land use of the catchment of the borehole is reflected more closely in the monitoring carried out.

We have 47 sample points for groundwater monitoring in the Plan area, 14 of which are located on outcrop areas and 33 in the confined part of the aquifer.

6.2.3 Targets

Groundwater WQOs are still under development and at present the only criteria normally applied is suitability for use as drinking water. It is difficult to establish WQOs for groundwater because it is naturally variable depending on the geology and hydrochemistry. Our network has been principally designed to observe long-term trends in groundwater chemistry.

6.2.4 Current status/trends

The major aquifer in the Plan area is the Lincolnshire Limestone. It outcrops at the surface in the centre of the catchment. Based on data from our groundwater quality monitoring network, in general, water in the limestone is of a quality suitable for potable supply and other general uses. There is some localised contamination of groundwater where pollutions are known to exist. Elevated chloride concentrations are often detected in the eastern part of the catchment, where saline intrusion is known to occur.

There are five major public water supply abstractions in the Plan area, one of which has been impacted by a pollution incident **(Issue 11).**

6.3 ESTUARIES

6.3.1 General

A GQA assessment is currently being developed for estuaries. In the meantime we are using the Coastal and Estuarine Working Party system (CEWP) to assess the water quality in estuaries. We have no statutory duty to monitor estuaries under the CEWP system but use it as a management tool to assess the environmental quality of estuaries. The system is a subjective way of classifying estuaries and the new GQA system is being developed as a replacement.

6.3.2 Monitoring

The CEWP system zones stretches of estuaries and each zone is allocated points depending on its biological quality, aesthetic quality and chemical quality. There are four classes ranging from A to D which classify the zone of the estuary as good, fair, poor, and bad respectively. The allocation of points is shown by **Appendix 12**.

6.3.3 Targets

Targets have not been formally established for the improvement to the quality of estuaries. The CEWP classification is used in the decision making process to target effort and to ensure improvements to the water quality of estuaries. The Agency will work with the water companies and industry to improve discharges which have a significant and adverse impact upon estuarial quality. Modelling of the estuary can be used to demonstrate the scale of the impact of certain major discharges. If discharges are identified as being of significant detriment to the estuary then the Agency will seek to ensure that the effluent is improved.

6.3.4 Current status/trends

The quality of tidal waters in the Welland continues to be good (Class A).

There are no significant discharges to this stretch of water with the exception of Spalding STW which is compliant with its consent.

Whilst the tidal Welland has no serious quality problems, attributed to BOD or ammonia,which materially affect uses, work by both MAFF and ourselves indicates that it is rich in nutrients, and is perhaps the most eutrophic of the Wash's estuaries - draining as it does extensive tracts of the intensively farmed fenland of Eastern England. This is an area that we are currently investigating.

6.4 THE ADEQUACY OF WATER RESOURCES

6.4.1 General

Water is abstracted for use in public water supply, general agriculture, spray irrigation and industrial purposes. Apart from a few exceptions, all abstraction of water whether from ground or surface waters is required to be licensed by the Agency to ensure a balanced and sustainable use of resources.

6.4.2 Monitoring

The main categories of hydrometric data gathered are rainfall, river flow, river levels, tidal levels, groundwater levels and meteorological data. River gauging stations provide information on water levels and flows, and groundwater observation boreholes on groundwater levels. These systems are progressively becoming automated and linked with telemetry. The gauging network provides long-term water resource information which is used to assess water resource trends, in addition to the immediate value for drought and flood warning.

6.4.3 Targets

There are no established targets for water resource management. Levels of service, however, currently under review, have been developed for public water supply which impact on the management of water resources. These are:

- a hosepipe ban on average not more than once in 10 years;
- need for voluntary savings of water on average not more than once in 20 years;
- risk of rota cuts or use of stand-pipes on average less than once in 100 years.

For irrigation, our guideline is that restrictions will not be imposed more than once in 12 years.

The hydrometric network provides us with data on the state of the water resource to aid its management. In certain hydrological catchments, the water resources are fully committed with the volume of licensed abstraction being equal to or greater than that deemed available for that purpose. In these areas no further abstraction licences will be granted. In areas where there is resource available, we will consider applications for abstraction and if the applicant can demonstrate that there would be no detriment to the environment or on other water users then the licence may be granted subject to conditions we may choose to impose.

Historically we have used "Minimum Residual Flows" to define levels below which abstractions are constrained. To enable us to manage the limited resources in a sustainable and consistent manner we are now developing the concept of River Flow Objectives (RFOs); these define target flow regimes for a range of high, medium and low flow scenarios, to which water resource management should aim in order to meet defined environmental objectives. These targets will take account of natural occurrences such as the periodic drying of some stretches of river.

The flow regime recommended by these studies will have an important impact on all Agency functions, allowing local environmental demands to be more accurately quantified. This in turn will improve groundwater balance calculations by refining the amount currently allocated for the environment. In addition the information when available will allow improved biological targets to be developed for each catchment and will assist in the setting of water quality consents to discharge.

6.4.4 Current State

6.4.4.1 Water Resources

The principle sources of water in the Plan area are the River Welland, Rutland Water Reservoir (which takes its water from both the Welland and Nene) and the Southern Lincolnshire Limestone aquifer. There is some water available locally from extensive gravel deposits north of Peterborough and from privately built winter storage reservoirs.

Surface Water

Rivers

The principle river in the Plan area is the River Welland which has a catchment area of some 1541sq kms. Water is abstracted by AWS from the River Welland at Tinwell just west of Stamford from where it is transferred to Rutland Reservoir under licence.

There is only limited abstraction for spray irrigation from the Welland, and it's tributaries, upstream of Stamford although there are a number of small, general agricultural use licences. The main use of water downstream of Tinwell is for spray irrigation from low level IDB drainage systems which are fed by unlicensed slackers from the main River Welland.

The West and East Glens form a sub catchment to the Welland, and flow north to south parallel to each other before joining to form the main River Glen which runs northeast towards the Wash. The upper reaches of the East and West Glens only flow intermittently in their channels and subsequently there is very little licensed abstraction from this part of the river system.

The middle and lower reaches of the West Glen are mostly perennial although flow can be intermittent around Shillingthorpe up to the confluence with the East Glen due to losses from the river bed. Flow in this reach is supported by the Gwash-Glen transfer scheme. There is some abstraction for spray irrigation along these reaches.

The canalised and impounded main River Glen and the Bourne Eau which feeds into it at Tongue End support some spray irrigation abstraction although most abstraction is from the surrounding low level IDB systems.

Reservoirs

Rutland Reservoir is owned by Anglian Water Services Ltd and is the largest reservoir operated by that company. In conjunction with a number of other pumped storage reservoirs located in adjacent catchments it forms part of the Ruthamford water supply system which supplies water to domestic and industrial customers in this and adjacent catchments.

The Reservoir is formed by an impoundment on the Gwash valley and is filled via pipelines from an intake on the River Welland at Tinwell and from the River Nene at Wansford in the Upper Nene catchment.

Abstraction from the reservoir is licensed at 120,000 tcma. The licence includes a condition requiring discharge of water downstream of the reservoir of 1,600 tcma. There is some concern that this compensatory flow from the reservoir to the Gwash does not fulfil it's "in-river needs" of the Gwash (**Issue 4**).

Eyebrook Reservoir to the south-west of Rutland Reservoir supplies water to Corby Steel works and Corby Power Station. It takes it's water from the River Welland at Tinwell upstream of the Rutland abstraction point.

Gwash-Glen Transfer

To compensate against the potential impact on flows in the River Glen as a result of an increase in actual abstraction by AWS from the Southern Limestone aquifer (which provides a baseflow component to the Glens in places), an agreement exists between AWS and the Agency which provides for releases from Rutland Water for subsequent transfer to the River Glen.

The scheme was commissioned in 1991 with flows in the lower part of the West Glen and the main River Glen being augmented in summer periods of low flow by transfers of water from the River Gwash. Flows in the Gwash are supported by releases from Rutland Water at a rate of or at least equal to that subsequently transferred to the West Glen. This compensation flow is in addition to the discharge required from the reservoir normally.

The inadequacies of the existing hydrometric network relating to this transfer hamper it's effective management which could adversely impact upon the environment (**Issues 1b** and **19**).

Low flows as a consequence of the ongoing drought situation are causing particular difficulties for the Maxey Cut. During recent summers we have had to undertake several fish rescues in what is primarily a flood relief channel constructed to carry flows away from Market Deeping. The uncertainty of flow also impacts upon the reliability of local abstractions (**Issue 20**).

Groundwater

The principle aquifer in the Plan area is the Southern Lincolnshire Limestone which stretches from south of Stamford up to the east of Grantham and beyond. The water resources of this aquifer are fully committed to existing licence holders.

For the purposes of this document when referring to the water resources of the limestone aquifer, the limestone aquifer extending from the Stamford area to a line north of Sleaford is considered, and not just the aquifer contained within the boundary of this catchment plan.

The Southern Lincolnshire Limestone aquifer, which extends into the Lower Witham catchment is fully developed for abstraction predominantly for public water supply and some agricultural use. No additional water is available for abstraction. Recharge (replenishment by rainfall) to the limestone aquifer occurs both within and outside this Plan area (to the north and east in the catchment). In general the balance of recharge minus abstraction forms the residual resources available to meet springflows.

The limestone aquifer has been the subject of considerable investigation and study, and a mathematical model has been developed to improve understanding of aquifer behaviour. The model of the limestone aquifer system allows the simulation of groundwater levels and surface water flows, given different recharge to the aquifer, and different levels of abstraction. The model has been refined and extended and the balance shown in the table below indicates preliminary figures from the groundwater model.

Table 10 : Water resources balance (southern /central limestone)

Aquifer inputs(I)/outputs(O) in tcmd	**Dry/Drought (c. 1 in 10yr)**	**Average**
Recharge available (I)	137	225
Licensed abstraction (O)	96.1	96.1
Total flow to springs (O)	40.9	128
Current abstraction (O)	79	79
Total flow to springs (O)	58	146

Note:

- tcmd means thousand cubic metres per day.
- Recharge and abstraction figures relate to the whole of the southern/central limestone aquifer.
- Effective resource available (from recharge) are derived from the southern/central limestone distributed groundwater model.
- Total estimated environmental needs are c. 60 tcmd on average.

The figures used in Table 10 (data base 1995) are based upon consideration of the gross recharge available for abstraction. In the Anglian Regional Water Resources Strategy the Agency reduces the gross limestone recharge by 40% to reflect the inadequacy of aquifer storage to fully even out year to year variations in recharge. The reduced quantity is referred to as 'effective resource' and it is this which is reliably available for allocation to either abstraction or to the environment.

From an initial consideration of data shown in Table 10 it is clear that under average recharge conditions there are sufficient resources available to meet abstraction and river needs both under conditions of current and licensed abstraction. However, one characteristic of the limestone is that it recharges very quickly and also discharges to springs very readily. In general, this leads

to strong baseflows to rivers and springs in winter and poor baseflows during summer months as the limestone has discharged much of its storage to springs during winter. With this in mind, under drought conditions this can lead to periods of little or no flow in some watercourses. There remains some concern that the existing level of licensed abstraction from this aquifer is not sustainable **(Issue 21)** and this is epitomised during extended dry periods when the lack of rainfall necessary to replenish this aquifer continues to create problems for a number of watercouses dependent on spring flows.

In 1991/2 following a period of drought, a programme of sealing 'wild boreholes' was carried out by our predecessor the NRA, to conserve water within the aquifer. The flora and fauna of some watercourses south of Bourne, which had historically benefited from this input of water, may have been impacted by this reduction in flow.

To alleviate the impact of low flows and subsequent loss of town amenity on the spring-fed Bourne Eau, we have worked in partnership with AWS and a local Bourne Trust to provide an augmentation borehole to support flows in the watercourse when required. This scheme has been operated successfully since 1995.

We are committed to alleviating problems where allocation of groundwater in the past has caused unacceptable stress on the water environment *i.e.* river flows and wetland sites of conservation value. A long term target of the Agency is to seek to revoke unused licences and to reduce under-used ones.

6.4.4.2 Abstraction

Abstraction of both surface and groundwater resources are dominated by the need for water to fulfil the needs of public water supply. Existing licensed levels of abstraction are shown on Table 10 below.

Table 11: Abstraction Details (TCMA)

Use	Gen. Agric.		Spray Irr.		PWS		Industrial		Others	
	S	G	S	G	S	G	S	G	S	G
No. of lic.	0	200	115	40	2	3	4	12	7	19
Total Quant. tcma	0	378	2941	516	120500	22710	4590	1797	22285	7251
% of total S	-	-	2	-	80	-	3	-	15	-
% of total G	-	1	-	2	-	70	-	5	-	22
% of total	0.2		2		78.3		3.5		16	

S - Surface Water Abstraction
G - Groundwater abstraction
Others - this is primarily mineral washings
Total Licensed Surface Water abstraction - 150316 tcma
Total Licensed Groundwater Abstraction - 32652 tcma
Total Surface + Groundwater Licensed abstraction - 182968 tcma

Notes:

PWS abstraction/licencetotals do not include the AWS water transfer from the Welland to Rutland Reservoir (31/9/S/79) or the EA held Gwash-Glen transfer licence (31/10/S/64) as these are inter catchment transfers of water and not actually water used (consumed).

The total licensed quantity within the catchment is 183000 tcma (rounded up), this amount being dominated by the 120,000 tcma Rutland Reservoir licence of which around only 60% is usually taken. By comparison in 1996 AWS took up 88% of their licensed groundwater quantity. Of the total 404 licences, 128 are for surface water (150316 tcma) and 274 for groundwater (32652 tcma). In addition there are two licences for non-consumptive inter-catchment transfer.

As with all the areas in the Region, winter water abstraction and storage for summer use from minor watercourses and drains is encouraged.

Competing demands for water can exceed the quantity available especially during periods of low flow when very often the demand in the Lower Welland for water increases. During such periods of excess demand, our ability to maintain river levels and flows becomes difficult because of the presence of sluices operated by the Welland and Deeping IDB to maintain levels within the fens drainage system for summer spray irrigation use. This is an unlicensed activity which is outside our control.**(Issue 19).**

Trends in Demand

Public Water Supplies

Public Water Supplies within the Plan area are met by the abstraction of groundwater from the Lincolnshire Limestone and from Rutland Water Reservoir.

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

Agricultural Demand

Recent research for the region indicates that demand for agricultural irrigation will increase by 1.7% per annum to 2001 and thereafter at a rate of 1% per annum.

Within this Plan area there is no scope for any licensing of additional summer surface water. There is no further water available from the Lincolnshire Limestone aquifer although there may be some scope for water abstraction from the minor sand/gravel aquifers where no unacceptable impact on other abstractors or the water environment would be caused. Most future demands will have to be met through development of winter storage reservoirs.

Industrial Demand

Some limited industrial demands for water within the Plan area may be met from existing resources. A recent proposal to construct a power station near Spalding using water (transferred from the adjacent Witham catchment) as the primary cooling agent has been discouraged by ourselves because it's use was not deemed to comply with the principle of sustainability where an alternative, air cooling, option exists.

6.4.5 The Quality and Availability of Data

The groundwater level network supplies adequate information on the major Lincolnshire Limestone aquifer resource. Some further monitoring may be appropriate to investigate losses from the R. Glen downstream of the transfer operation **(Issue 16).**

Where further abstraction from the minor sand/gravel aquifers is proposed, abstractors/developersmay be required to carry out baseline and ongoing monitoring around their operations to assess the impact on the local water table.

Some refurbishment of existing gauging sites and installation of new gauging sites is required to improve the accuracy of flow measurements and the effectiveness of flood forecasting and control.

6.5 FLOOD DEFENCE

6.5.1 General

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

The standard of flood defence provided depends on the type of land being protected and whether it is being protected from tidal or fluvial flooding. Urban flood defences are usually built to a higher standard than those for agricultural land. The Agency exercises a general supervision over all matters relating to flood defence in England and Wales and has prescribed responsibilities for land drainage and flood defence along with Internal Drainage Boards, Local Authorities and Coastal Authorities.

6.5.2 Monitoring

We undertake the general monitoring of those flood defences for which we are responsible as part of our ongoing and operational procedures. In addition to this as part of our statutory duties we have to carry out surveys to identify flood risk areas.

A system is currently being developed which identifies current standards of flood defence and areas at risk of flooding and the costs of maintaining defences and benefits which accrue. Known as the Standards of Service Survey this will provide a series of cost to benefit ratios which will help target available resources in the most cost effective way.

Our hydrometric network of rain gauges and river flow gauging stations, supplemented by telemetry outstations, continuously monitor river levels and flows at key sites. Together with access to the Meteorological Office 'STORM' rain radar system, these provide us with the ability to predict fluvial flooding events. Information from the Met. Office Storm Tide Warning Service gives advance warning of possible tidal flooding. An existing shortfall in flood warning data has been identified in the area and will be addressed by the extension of our telemetry system . **(Issue 1a)**

The monitoring of tidal levels in the long-term will allow the Agency to make a judgement as to the scale and extent of sea level rise through global warming if such a phenomenon exists. In the event of sea level rise seawalls and other coastal defences will have to be raised and improved to ensure that present standards are maintained.

Flood Defence Planning

The long term capital and maintenance programmes of the Agency are developed within the framework of Shoreline Management Plans (SMPs) and our own Regional Flood Defence Target Standards.

SMPs provide the framework for sustainable coastal defence policies along coastlines and set objectives for the future management of the shoreline. One such has been developed for the Wash and this covers the Welland coastline. We will use this document as a basis for developing our flood defence strategy for the Welland (and Wash) coastline.

The Anglian Region Flood Defence Target Standards sets out target standards of flood protection expressed as a flood return period. For example a flood with a return period of 1 in 100 years has a 1% chance of occurring in any one year.

6.5.3 Targets

Notional target standards of protection for tidal and fluvial defences are developed from our Standards of Service Targets and MAFF guidance notes of indicative standards of protection for different types of land use. These notes also give guidance on economic justification.

The 5 bands of land use are shown in Table 12.

Table 12: Flood Defence Standards of Service

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

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

Flood Warning Targets

We have a target to issue notice of flooding to property, 2 hours prior to it occurring. More generally we aim to disseminate information as quickly, accurately and comprehensively as possible. Flood warning dissemination plans have been produced for all identified flood risk areas and these will be continuously reviewed in the light of experience in operation. Generally within any Plan area warnings will be issued in the following ways:

- By regular media broadcasts on radio and TV inc. Teletext;
- In certain cases by automatic voice messaging (telephone);
- In certain cases via Flood Wardens;
- By loud hailer or siren.

6.5.4 Current State

Map No. 6 shows the existing standards of protection against both tidal and fluvial flooding.

In the fenland part of the catchment all protected areas associated with Main River meet the target standards of flood defence in terms of return period. Significant investment is on-going to maintain the integrity of these defences. Our routine maintenance budget which amounts to some £600k per annum is focused upon bank maintenance in the form of stone strengthening of the Welland and Glen tidal channels; and bank mowing and weed control along raised embankments.

In the upland part of the catchment there are a number of locations along the Welland and Glen Rivers where the target standards are not met and properties are at risk of flooding from relatively low return period events. These are small rural settlements where the level of expenditure required to meet the target standard cannot be justified in cost/benefit terms (see **Issue 2**)

We are currently reviewing the stability of the banks of the lower Glen as part of our regular appraisal of defence standards. The outcome of this report is expected late in 1997.

A longstanding problem exists with respect to the siltation of river outfalls to the Wash Estuary and to the Welland in particular (see **Issue 3**). This problem reflects a number of issues:

a) low river flows which might otherwise flush this sediment from the river channel into the Wash;
b) the accumulation of sediment in the Wash itself, impacting on the outfall;
c) land tilt and rising sea levels .

The changing use of Surfleet Reservoirs is a further concern for us. Historically an area of land immediately behind the tidal doors of the River Glen at Surfleet had been developed as a storage area in the event of high river flows. This use has however been precluded by the development of holiday chalets some of which have become permanent residences at significant risk of flooding (**Issue 6**).

6.5.5 Trends

The predicted gradual rise in sea level resulting from global warming will mean that at some point in the future it will become necessary to raise sea and tidal defences.

In recent years rainfall rates have been below average and few major flooding events have occurred.

Increasing environmental awareness has been influencing the manner in which flood defence works have been constructed and maintained and it is likely that this influence will increase rather than diminish in future.

6.5.6 Quality and Availability of Data

Hydrometric data, rainfall and river flow records are generally quite good with a fairly comprehensive network of stations established across the catchment, some of which have been in existence in excess of 50 years. There has been identified a shortfall of gauging which has been addressed by our Area Regional Telemetry review which is looking to improve the network within this Plan area (**Issue 1**).

Many flood records have been lost during the frequent reorganisations within the water industry prior to the establishment of the now defunct National Rivers Authority. However the current and expanding telemetry network should provide a reliable data source for the future.

6.6 LAND

6.6.1 Derelict and Contaminated land

6.6.1.1 General

Derelict and contaminated land is that defined as any land which appears to a local authority to be in such a condition, because of the substances it contains, that it could cause, or may already be causing water pollution or significant harm. This interpretation is subject to guidance by the Secretary of State. Some sites may become designed as 'special sites' and these will become the responsibility of the Agency. None has yet been designated, as the Regulations that will bring the primary legislation into effect have not (at the time of writing) been finalised nor passed by Parliament.

Landfill sites that closed before 1994 when the new Waste Management Regulations came into force (which made the operator of a site responsible for it after it has closed) may fall within the 'Special Site' definition.

Because of the potential for harm that these landfill sites might pose, local planning authorities must consult with ourselves on any development proposed within 250m of any landfill site.

6.6.1.2 Targets

The Environment Agency has specific duties under the Environment Act 1995 with respect to contaminated land. Our aim is to secure, with others, the remediation of contaminated land.

6.6.1.3 Current State

The extent of sites deemed to be derelict or contaminated under recent legislation is currently unknown. Under proposed legislation local authorities will place on a Public Register those sites upon which it serves a remediation notice and have to develop a strategy to identify such sites.

Within the Welland Catchment, the former landfill site at Helpston **(see Issue 11)** is an example of a site which has contaminated a valuable water resource and which, because of the circumstances, we are involved in managing the incident.

6.7 PERFORMANCE OF WASTE MANAGEMENT FACILITIES

6.7.1 General

Waste disposal is the returning of unwanted materials into the environment. If carefully managed, the substances that comprise wastes can be safely dispersed and returned to the environment. If waste disposal is badly managed, wastes and substances derived from them may give rise to environmental pollution, which can be serious and long lasting. Adequate, well managed treatment and disposal facilities are required to cope with wastes produced.

Different types of waste management facilities include, landfill, transfer stations, civic amenity sites, treatment plants, incinerators scrap yards and recycling process plants. Planning permission will normally be required for the development of a waste management facility. The siting of waste recovery and disposal facilities is decided through the land use planning system by the local planning authorities.

Waste directly affects the environment when it is disposed. Waste sites may affect ground and surface water, they may also affect air quality and result in land contamination, if they are not managed and regulated effectively.

We are required under Section 42 of the Environmental Protection Act 1990 to supervise licensed waste management activities. We regulate waste management facilities which are developed and operated to prevent pollution of the environment, harm to human health, and serious detriment to the local amenity.

6.7.2 Monitoring

The licence conditions for landfill sites requires the site operator to monitor for landfill gas, leachate levels and the quality of groundwater and surface water both within and in the near vicinity of the site. Other indicators include air quality, noise, dust, smell, and litter depending on the characteristics of each site. Licence conditions are established for other types of waste management facility such as Transfer Sites depending upon the risk that each operation poses.

The monitoring of waste management facilities is a statutory duty and guidance is set out by the Department of the Environment as part of Waste Management Paper No.4. Monitoring frequency is established by this guidance and site visits are dependant on the type of waste deposited and risk of each facility.

Compliance with licence conditions is checked by regular inspections and environmental monitoring, in addition to which we audit the monitoring carried out by operators.

6.7.3 Targets

The objective of the waste management licensing system is to provide a separate control system and ensure that waste management facilities:

- do not cause pollution of the environment;
- do not cause harm to human health;
- do not become seriously detrimental to the amenities of the locality.

In assessing pollution we have to consider the impacts of emissions on global climate change and on local air, water, soil flora and fauna.

The government's policy framework for the management of waste identifies ways in which waste can be managed in a more sustainable way, and sets targets for achieving that aim.

The Strategy is based on three key objectives:

- to reduce the amount of waste that society produces - waste minimisation,;
- to make the best use of the waste produced - recycle and re-use;
- to choose waste management practices which minimise the risks of immediate and future environmental pollution and harm to human health.

The Government's Producer Responsibility initiative will be a key tool for promoting the recovery of value from waste. It is designed to ensure that industry assumes an increased share of the responsibility for the waste arising from the disposal of its products. The most advanced producer responsibility scheme is found in the packaging industry for which the government have set a target to recover 50-65% of packaging waste by 2001. A number of other industries have been invited to set recovery targets.

There are no catchment wide targets for waste management facilities. Targets are site specific and are determined as part of their licence conditions. The licence conditions for landfill sites may for example set trigger levels for groundwater quality.

In general, groundwater quality is measured before a site is engineered, and ongoing monitoring checks that background quality is not diminished. Leachate indicators that are monitored in groundwater include; ammonium, chloride, carbon and pH. The detection of substances above "trigger levels" indicates the possible need for remedial action. Minimum standards have been established by the Waste Management Paper No 4 for the open and closed phases of site operation. Discharge conditions on surface water disposal from site may also form part of a waste management licence and may require a Water Quality Consent under the Water Resources Act 1991. Landfill gas is monitored for three main parameters; methane, carbon dioxide and

oxygen and once again criteria have been met for maximum concentration of gas as the boundary of the site.

6.7.4 Current Status

There are relatively few waste management facilities within this area, and for these, as with similar sites throughout the area compliance may not be absolute (with typically over 50 conditions to comply with this is not surprising). Our system of inspection, monitoring and auditing is in place and ensures waste management facilities meet the required standards. Where problems are found operators are made to remediate any pollution and may suffer prosecution and/or revocation of the licence if it is deemed appropriate. All monitoring and inspection reports are available for view on Agency Public Registers.

Flood walls at Stamford

6.8 RADIOACTIVITY

6.8.1 General

The Environment Agency has to ensure that the authorised discharges of radioactive waste to the environment deliver compliance with the requirements of radiological protection criteria in general and with dose limits for the public in particular. The greatest source of radiation to the public in England and Wales is actually that which arises from the natural background eg. Radon. Background radiation is not however the only source of radiation to which the population is routinely exposed. Medical (X-rays) and occupational exposures both add to the average dose rates, as does residual fallout from the atmosphere testing of nuclear weapons. Collectively these anthropogenic exposures add about another 0.3 or 0.4 milli-Sieverts per year. Radioactive discharges from nuclear sites account for only about 0.0004 milli-Sieverts per year to the average member of the public. Discharges of radioactive materials to the environment are very carefully controlled.

6.8.2 Targets

The International Commission for Radiological Protection set dose standards which the UK government have implemented through the National Radiological Protection Board. The current limit for exposure of the public from all man-made sources of radioactivity (other than medical exposure) is 1 milli-Sievert per year which, although very much less than the background rate, is considered to reflect the low-level of acceptable additional risk for members of the public. It is also important to note that, because man can be exposed simultaneously to both internal and external radiation, the dose received is assessed by adding together both internal and external radiation exposures.

In the context of radioactivity, the guiding principle in minimising risk from exposure to radioactivity is to ensure the levels of activity used are "as low as reasonably achievable (ALARA)" and the use is justified in relation to the benefit conferred. Because radioactivity can be measured accurately in very low concentrations, the standards to be achieved are high.

6.8.3 Monitoring

Authorised users of radioactive material, for example industrial, research or medical users are not monitored by the Agency. We have the authority to request the monitoring of the usage/disposal of waste from such authorised processes, however, the majority of authorisations use radioactive materials in small doses with relatively short half-lives which provides a low dose risk to the public. Therefore monitoring to scrutinise the majority of these disposal pathways is not seen as necessary by us. Operators are liable to compliance inspections by our staff.

6.8.4 Current State

Radioactive materials are used for a variety of purposes within the catchment, including medical diagnosis and therapy, research, industrial uses and in the farming industry as measuring devices in harvesting machinery. The regulation of radioactive substances in certificated and authorised uses remains a high priority aspect of our work and there are currently no concerns with respect to this activity.

6.9 AIR QUALITY

6.9.1 General

Atmospheric pollution, resulting from man's activity on earth, is a local, national and global concern affecting the health of us all and the environment in general. Air pollution can occur from a number of sources and may be in the form of gas or particulate matter. The dispersion and dilution of pollutants depends on wind direction and climatic conditions and it does not respect administrative or hydrological boundaries.

Air pollution can aggravate respiratory problems such as asthma and bronchitis. It can also contribute to the deterioration of historic buildings by chemical erosion caused by acid rain and it is believed to be accelerating changes in the climate, reducing the atmosphere's natural protection against harmful radiation and increasing sea levels.

The main sources of sulphur dioxide and nitrogen oxides (the most important gases contributing to acid rain) are emissions from road transport, power stations, industry and the burning of fossil fuels for domestic purposes.

Emissions from road transport have a wide variety of environmental effects. Geographically, direct effects are normally limited to the main area near the road, however many motor vehicle pollutants react to form secondary pollutants which can cause photochemical smog.

Other atmospheric pollution such as methane gas is generated from agricultural activity, natural gas production and distribution, and from refuse and sewage disposal. Chlorofluorocarbons (CFC's) used in refrigerators, solvents and aerosol can propellants, and halons used in firefighting chemicals are powerful ozone depleting gases. These are now being phased out as more environmentally friendly alternatives become more readily available.

Under the Environmental Protection Act 1990 (EPA '90) responsibilities for the control and monitoring of air pollution is placed upon local authorities and the Agency.

Whilst our role is limited to regulating those industrial processes identified under Part A of EPA '90 and subject to Integrated Pollution Control (IPC) legislation, that of local authorities is wider, involving emissions to air from smaller and less polluting industrial sources which are subject to Local Authorities Air Pollution Control (LAAPC) legislation, and emissions to air from diffuse and other sources regulated under other legislation such as the Clean Air Acts.

All processes subject to IPC and LAAPC are required to meet the objective that the best available techniques not entailing excessive cost (BATNEEC) are used to prevent pollution occurring. For IPC authorised sites, where this is not possible, processes must minimise their release and render them harmless having regard for the best practicable environmental option (BPEO) available (in respect of those substances which may be released to the air, water or land). In this context, consideration of BATNEEC and BPEO are, primarily, site specific.

6.9.2 Monitoring

The DoE and some local authorities have a network of monitoring sites which we have access to and make use of.

Conditions set out in IPC Authorisations include provisions requiring operators to monitor their releases to the atmosphere and other media, and to measure their performance against defined parameters and to report to ourselves. This information is placed on public registers.

We undertake routine and unannounced inspections of prescribed processes to ensure that the authorisation conditions are complied with, checking releases using our own contractors. The IPC function of the Agency is quality assured to ISO 9001 standards.

6.9.3 Targets

The government has published it's National Air Quality Strategy, and both ourselves and local authorities are key players. The strategy has involved the setting of air quality standards which are based on the best available scientific and medical knowledge and experience. Accordingly the government has set a range of air quality standards having received advice from its own Expert Panel on Air Quality Standards and the World Health Organisation amongst others.

Standards for setting objectives are set with regard to scientific and medical evidence on the effects of the particular pollutant on health, or in the appropriate context, on the wider environment, as minimum or zero risk levels. Costs and benefits, and matters of current technical feasibility, come into play at the later stage, in setting objectives and timescales.

No release into any environmental medium may be authorised which would cause a breach of a statutory Environmental Quality Standard (EQS). EQS for air are set for: Benzene, 1,3 Butadiene, Lead, Nitrogen Dioxide, Ozone, Suspended Particles, Sulphur Dioxide and Carbon Monoxide.

Table 12 shows the range of government standards, set in respect of a number of pollutants, for which we have produced pollution concentration maps. These maps appear on the following pages as indicators of air quality in this area.

Table 12: Summary of Proposed Objectives

Pollutant	Standard		Objective - to be achieved by 2005
	Concentration	**Measured as**	
Benzene	5 ppb ($16.2\mu g/m^3$)	running annual mean	**5 ppb**
1,3-Butadiene	1 ppb ($2.24\mu g/m^3$)	running annual mean	**1 ppb**
Carbon monoxide	10 ppm[a]	running 8-hour mean	**10 ppm**
Lead	0.5 $\mu g/m^3$ ($500ng/m^3$)	annual mean	**0.5 $\mu g/m^3$**
Nitrogen dioxide	150 ppb[a]	1-hour mean	**150 ppb, hourly mean***
	21 ppb ($40\mu g/m^3$)	annual mean	**21 ppb, annual mean***
Ozone	50 ppb	running 8-hour mean	**50 ppb, measures as the 97th percentile***
Fine particles (PM_{10})	50 $\mu g/m^3$	running 24-hour mean	**50 $\mu g.m^3$ measured as the 99th percentile***
Sulphur dioxide	100 ppb ($267\mu g/m^3$)	15 minute mean	**100 ppb measured as the 99.9th percentile***

ppm = parts per million; ppb = parts per billion; $\mu g/m^3$ = micrograms per cubic metre
* = these objectives are to be regarded as provisional.

Figure in brackets are for comparison with pollution concentration maps.
[a] No data currently available to generate pollution prevention maps.

Air Quality Planning

The Government's strategy will place duties on Local Authorities to assess local air quality and, where it is shown to be necessary, according to nationally agreed criteria, prepare local air quality management plans for operation in defined areas, where targets are unlikely to be met. Such plans may place constraints on industrial emissions, may involve traffic management or involve other initiatives.

We will play our part by contributing to such local plans and by ensuring that industry, regulated by ourselves, is adequately controlled.

6.9.4 Current State

Air quality within the UK has been improving in recent years and these improvements are set to continue over the next decade. The new systems for dealing with industrial pollution introduced by the Environmental Protection Act 1990, new vehicle standards, and other measures aimed at mitigating the environmental effects of traffic are addressing the reduction of emissions. The UK confidently expects to meet its existing international commitments for reductions in emissions of volatile organic compounds and oxides of nitrogen and sulphur dioxide.

There remain, however, important challenges and uncertainties. For example, the recurrence of ozone episodes, particularly in summertime, and the recent publication of research into the effect on public mortality of the wintertime smog episode of December 1991 in central London have again raised public concern about air quality.

The Contribution to Air Pollution from Different Sectors

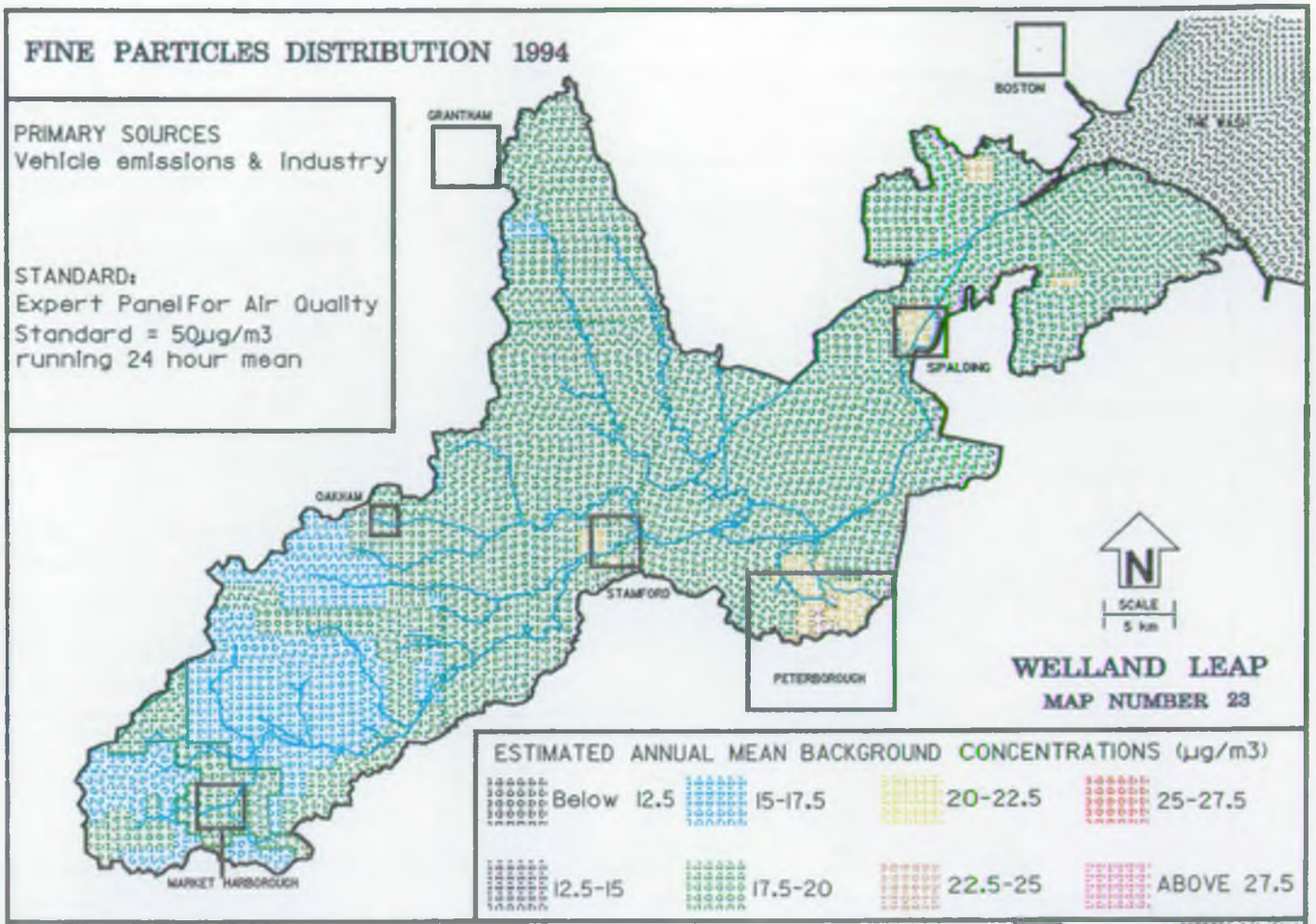
Table 13 shows the relative contribution of different sectors to total national emissions of the pollutants covered in this strategy (ozone is not emitted directly - the pollutants which lead to its formation, nitrogen oxides and volatile organic compounds, are given). It must be remembered that these figures do not necessarily reflect the relative contribution of these sectors to any particular area, including pollution "hot-spots" or problem areas. There is a great deal of variation between urban and rural areas, and between residential, commercial and industrial areas.

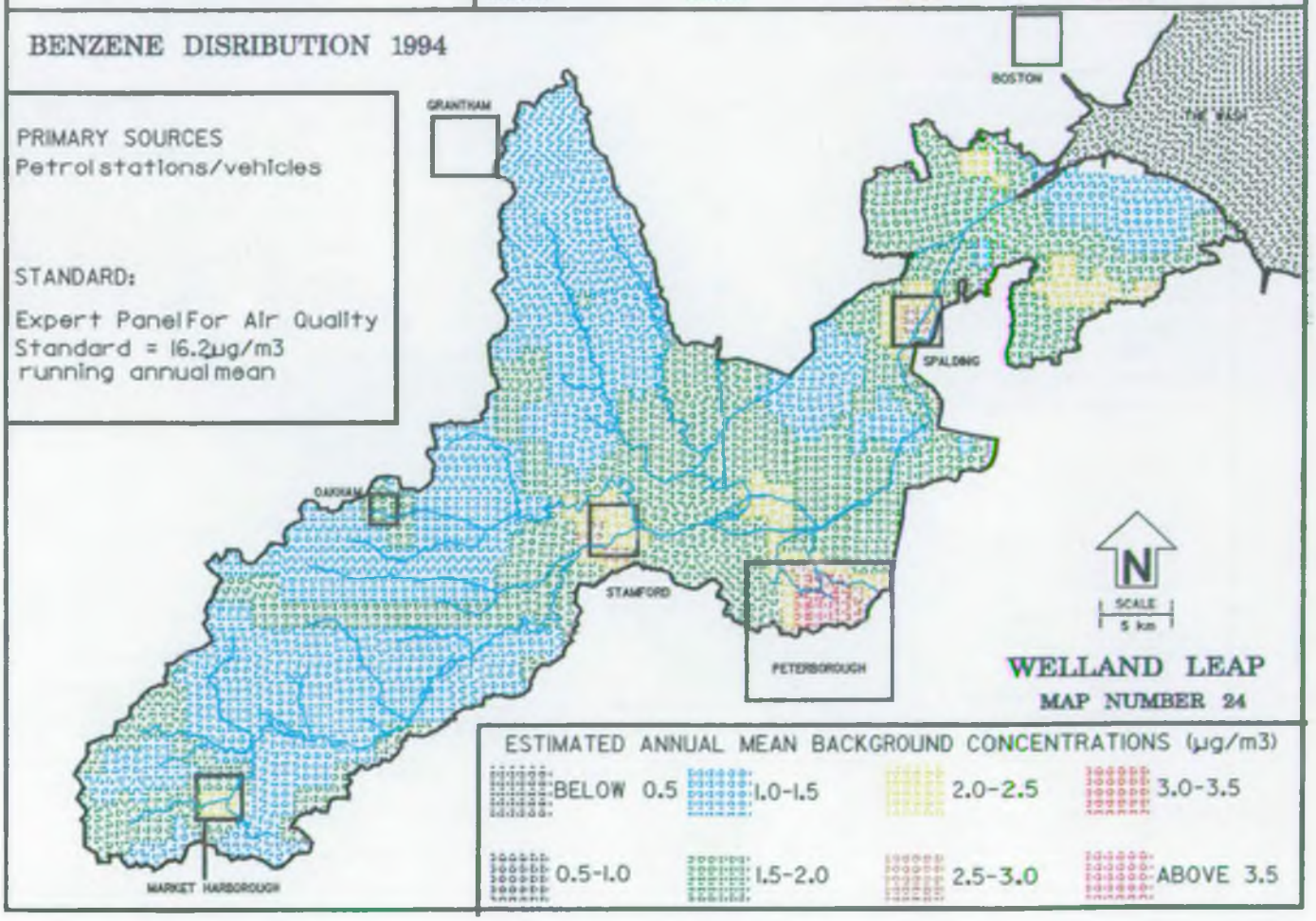
Table 13: Industrial emissions in the United Kingdom

Pollutant	Total UK Emissions in 1995 (kilotonnes)	Industrial Emissions (kilotonnes)	Industry as % of total
Benzene	35	6.9	20
1,3-Butadiene	9.6	1.2	13
Carbon monoxide	5478	667	12
Lead	1492[1]	276[1]	18
NO_x	2293	852	37
Particles	232	135	59
Sulphur dioxide	2365	2112	89
NMVOCs	2257	1195	53
[1] tonnes			

NB Ozone is a secondary pollutant formed from nitrogen oxides NOx and non-methane volatile organic compounds NMVOCs.

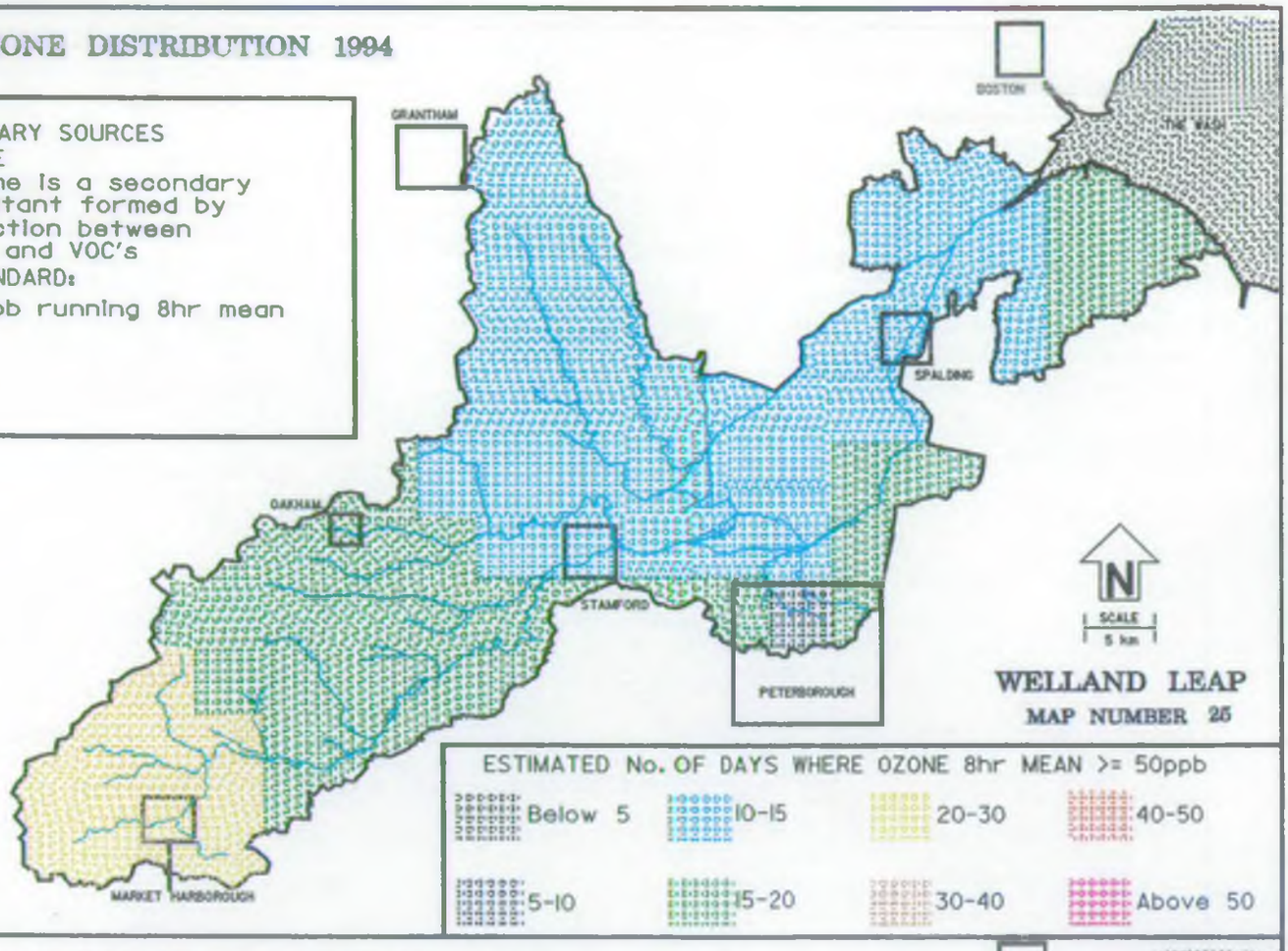
The following Maps (**Map Nos. 23 to 29**) show for those pollutants given in Table 13, the levels of pollution concentration along with the relevant Air Quality Standard. They have been produced on our behalf by AEA Technology using quality assured data from archives of information held by AEA's National Environmental Technology Centre. The maps presented have been extracted from maps calculated for the DoE and are therefore consistent with maps produced elsewhere. They have been derived from maps calculated to provide estimates of air quality for the whole of the UK, zoomed in to show the Welland area.


FINE PARTICLES DISTRIBUTION 1994
PRIMARY SOURCES
Vehicle emissions & Industry
STANDARD:
Expert Panel For Air Quality
Standard = 50µg/m3
running 24 hour mean
BOSTON
THE WASH
GRANTHAM
SPALDING
OAKHAM
STAMFORD
PETERBOROUGH
MARKET HARBOROUGH
N
SCALE
5 km
WELLAND LEAP
MAP NUMBER 23
ESTIMATED ANNUAL MEAN BACKGROUND CONCENTRATIONS (µg/m3)
Below 12.5
12.5-15
15-17.5
17.5-20
20-22.5
22.5-25
25-27.5
ABOVE 27.5


BENZENE DISRIBUTION 1994
PRIMARY SOURCES
Petrol stations/vehicles
STANDARD:
Expert Panel For Air Quality
Standard = 16.2µg/m3
running annual mean
BOSTON
THE WASH
GRANTHAM
SPALDING
OAKHAM
STAMFORD
PETERBOROUGH
MARKET HARBOROUGH
N
SCALE
5 km
WELLAND LEAP
MAP NUMBER 24
ESTIMATED ANNUAL MEAN BACKGROUND CONCENTRATIONS (µg/m3)
BELOW 0.5
0.5-1.0
1.0-1.5
1.5-2.0
2.0-2.5
2.5-3.0
3.0-3.5
ABOVE 3.5

OZONE DISTRIBUTION 1994

PRIMARY SOURCES
NONE
Ozone is a secondary pollutant formed by reaction between NOx and VOC's
STANDARD:
50ppb running 8hr mean



WELLAND LEAP
MAP NUMBER 25

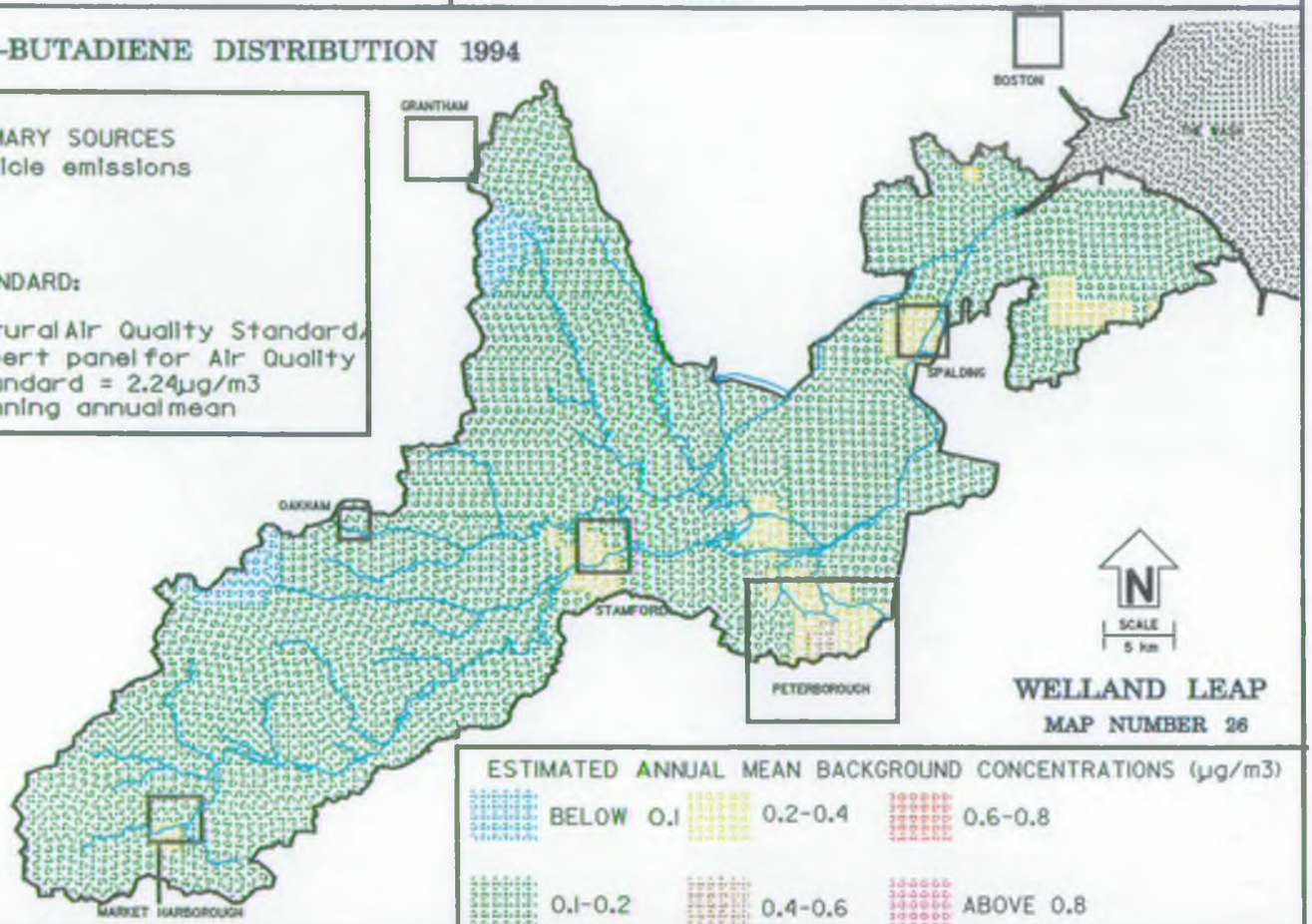
ESTIMATED No. OF DAYS WHERE OZONE 8hr MEAN >= 50ppb

Below 5	10-15	20-30	40-50
5-10	15-20	30-40	Above 50

1,3-BUTADIENE DISTRIBUTION 1994

PRIMARY SOURCES
Vehicle emissions

STANDARD:
Natural Air Quality Standard Expert panel for Air Quality Standard = 2.24µg/m3 running annual mean



WELLAND LEAP
MAP NUMBER 26

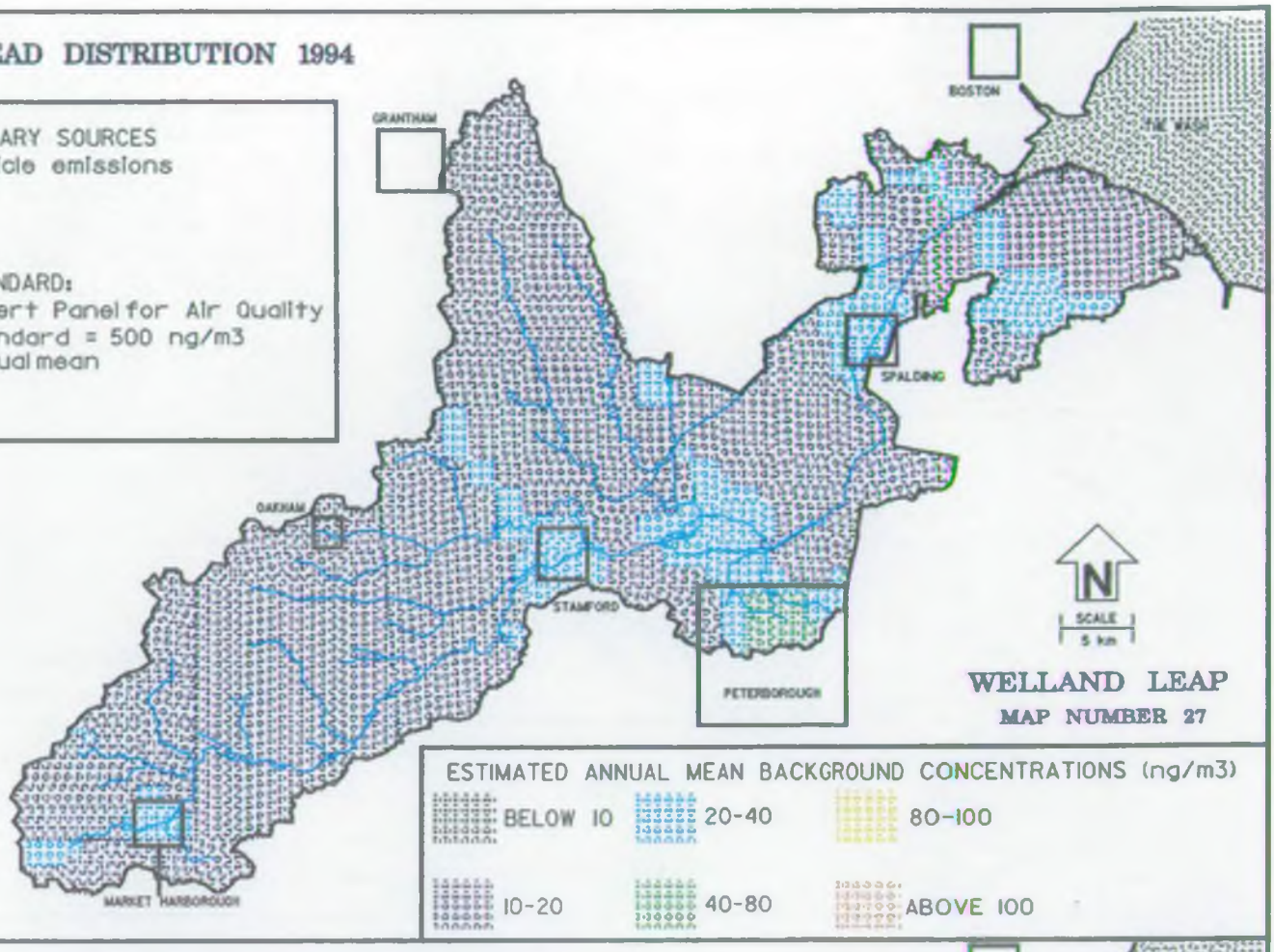
ESTIMATED ANNUAL MEAN BACKGROUND CONCENTRATIONS (µg/m3)

BELOW 0.1	0.2-0.4	0.6-0.8
0.1-0.2	0.4-0.6	ABOVE 0.8

LEAD DISTRIBUTION 1994

PRIMARY SOURCES
Vehicle emissions

STANDARD:
Expert Panel for Air Quality
Standard = 500 ng/m3
annual mean



WELLAND LEAP
MAP NUMBER 27

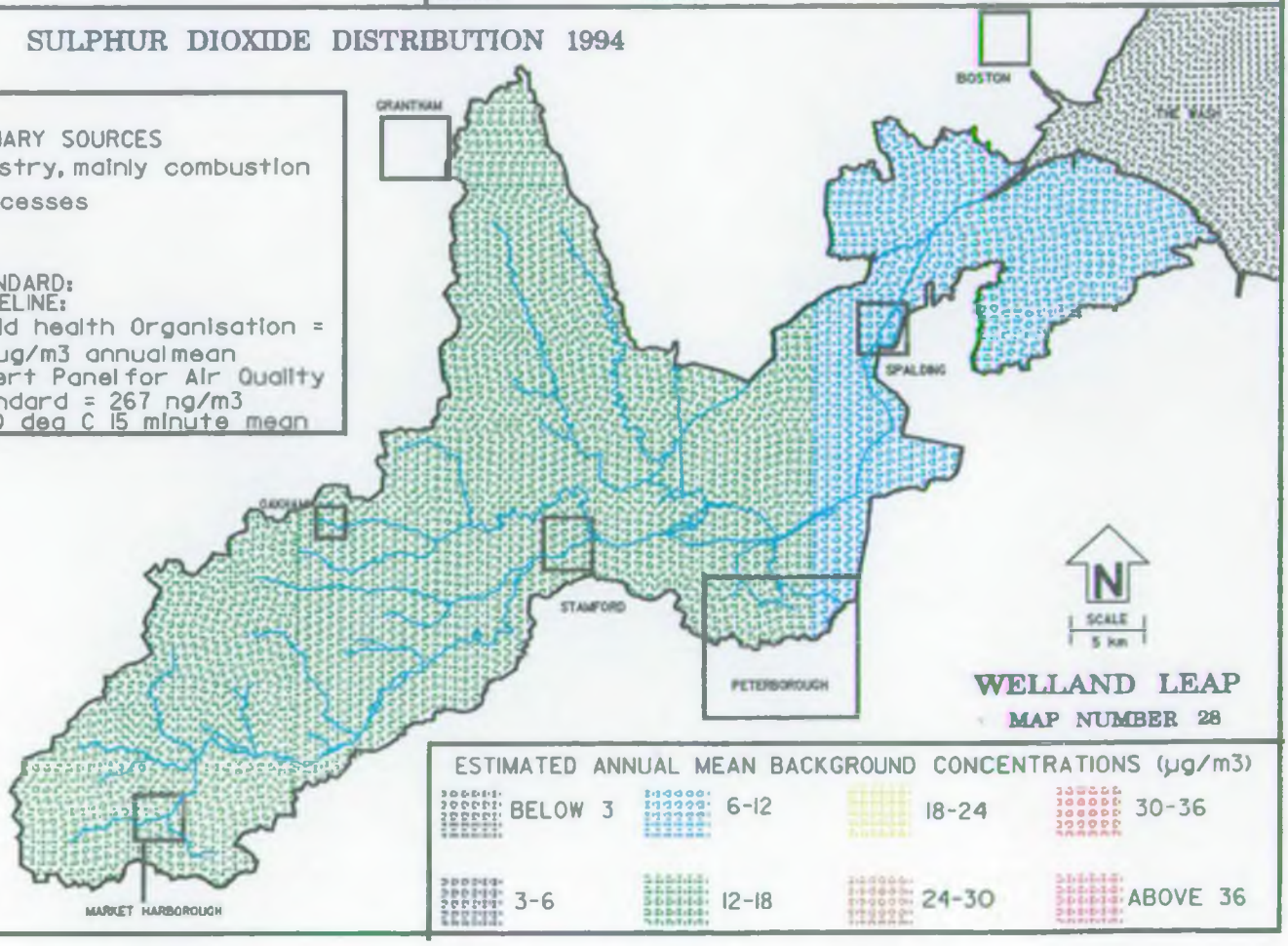
ESTIMATED ANNUAL MEAN BACKGROUND CONCENTRATIONS (ng/m3)

BELOW 10	20-40	80-100
10-20	40-80	ABOVE 100

SULPHUR DIOXIDE DISTRIBUTION 1994

PRIMARY SOURCES
Industry, mainly combustion processes

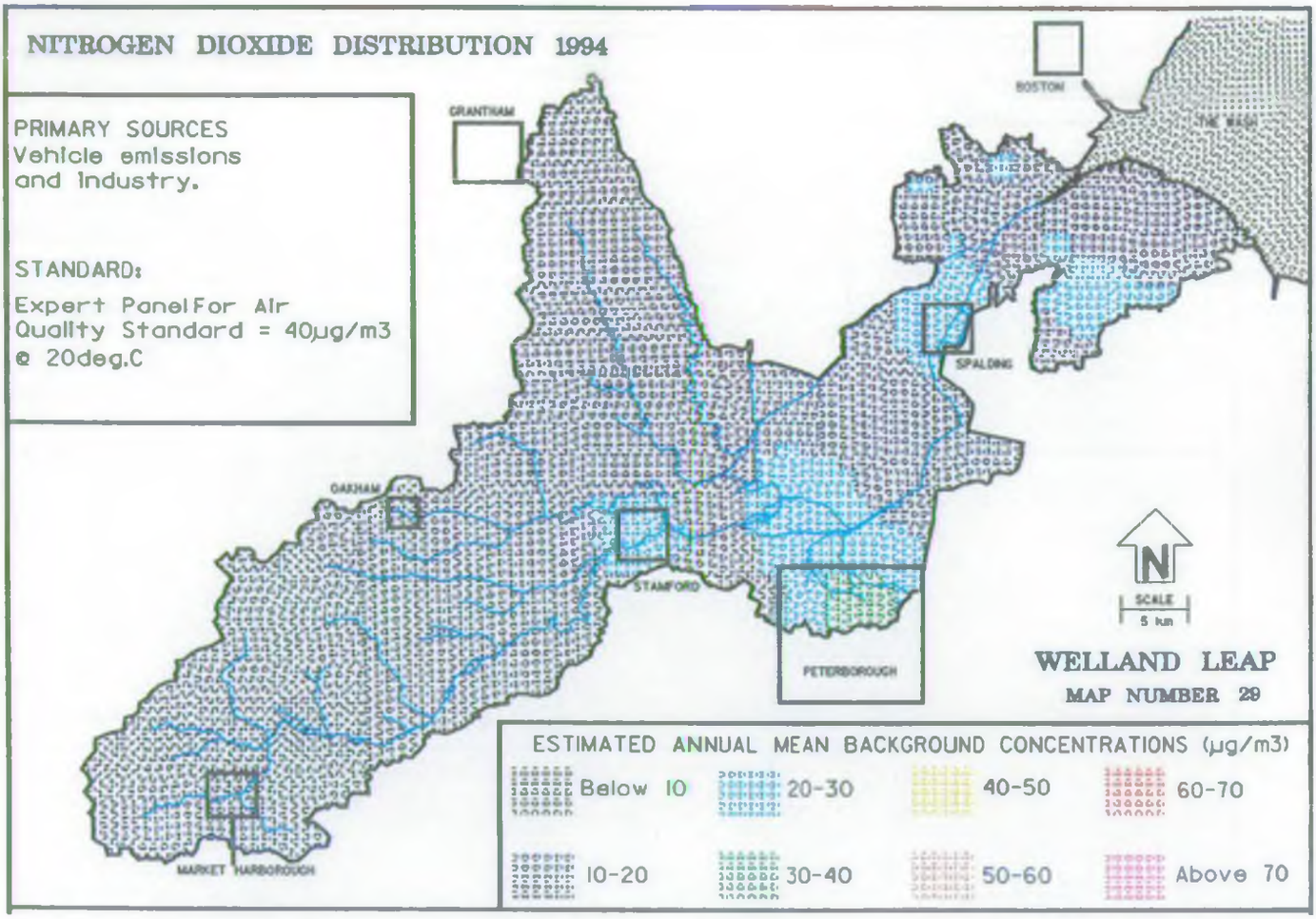
STANDARD:
GUIDELINE:
World health Organisation =
50 µg/m3 annual mean
Expert Panel for Air Quality
Standard = 267 ng/m3
@ 20 deg C 15 minute mean



WELLAND LEAP
MAP NUMBER 28

ESTIMATED ANNUAL MEAN BACKGROUND CONCENTRATIONS (µg/m3)

BELOW 3	6-12	18-24	30-36
3-6	12-18	24-30	ABOVE 36


NITROGEN DIOXIDE DISTRIBUTION 1994
PRIMARY SOURCES
Vehicle emissions
and industry.
STANDARD:
Expert Panel For Air
Quality Standard = 40µg/m3
@ 20deg.C
GRANTHAM
BOSTON
THE WASH
SPALDING
OAKHAM
STAMFORD
PETERBOROUGH
MARKET HARBOROUGH
N
SCALE
5 km
WELLAND LEAP
MAP NUMBER 29
ESTIMATED ANNUAL MEAN BACKGROUND CONCENTRATIONS (µg/m3)
Below 10
10-20
20-30
30-40
40-50
50-60
60-70
Above 70

6.10 WILDLIFE

6.10.1 General

We have a duty under the Environment Act 1995 to have regard to conservation with respect to all of our pollution control and waste management functions, and to further conservation with regard to all our other activities (flood defences works etc.). Our conservation duties are particularly relevant in achieving the objective of sustainable development, which we are committed to following the government's adoption of Agenda 21.

We are committed to working with English Nature and the Wildlife Trusts towards producing Local Biodiversity Action Plans at regional and local levels. Biodiversity Action Plans are currently being prepared to target species and habitats that are under threat. A number of these species / habitats are related to the aquatic environment which is of particular concern to the Agency and this will be reflected in the production of subsequent revisions of LEAPs.

Presently within Anglian Region the species that are being targeted include; otter, water vole, and crayfish along with the Chalk Stream Habitats.

6.10.2 Monitoring

River Corridor Surveys (RCS) are undertaken by ourselves to assess the ecological quality of the rivers. These surveys consider the botanical species in the river, on the banks and within the adjacent 50 metre corridor, in addition to the bird species. Surveys have been completed for every 500 metre section of Main River in Anglian Region. Future surveying will target more vulnerable rivers and therefore some sub-catchments will be assessed more frequently.
River Habitats Surveys (RHS) are currently being undertaken to complement the RCS. These classify the environmental condition of rivers with regard to physical features such as riffles, pools, wet shelves, cliffs and other habitat features to determine their habitat value to wildlife.

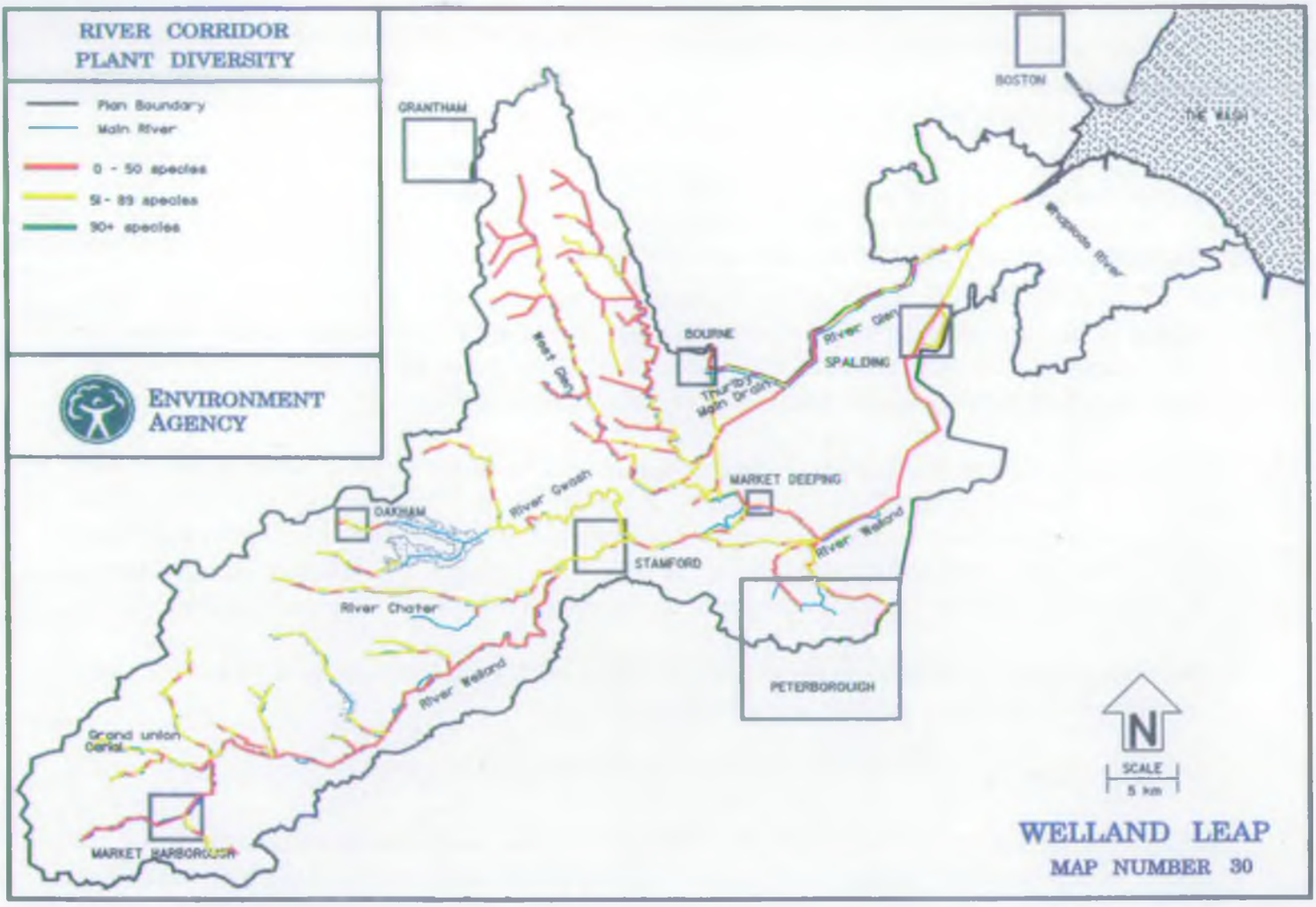
Both the RCS and RHS are aimed at identifying degraded as well as important stretches of river in order to protect valuable features/wildlife and identify opportunities to rehabilitate and enhance degraded habitats.

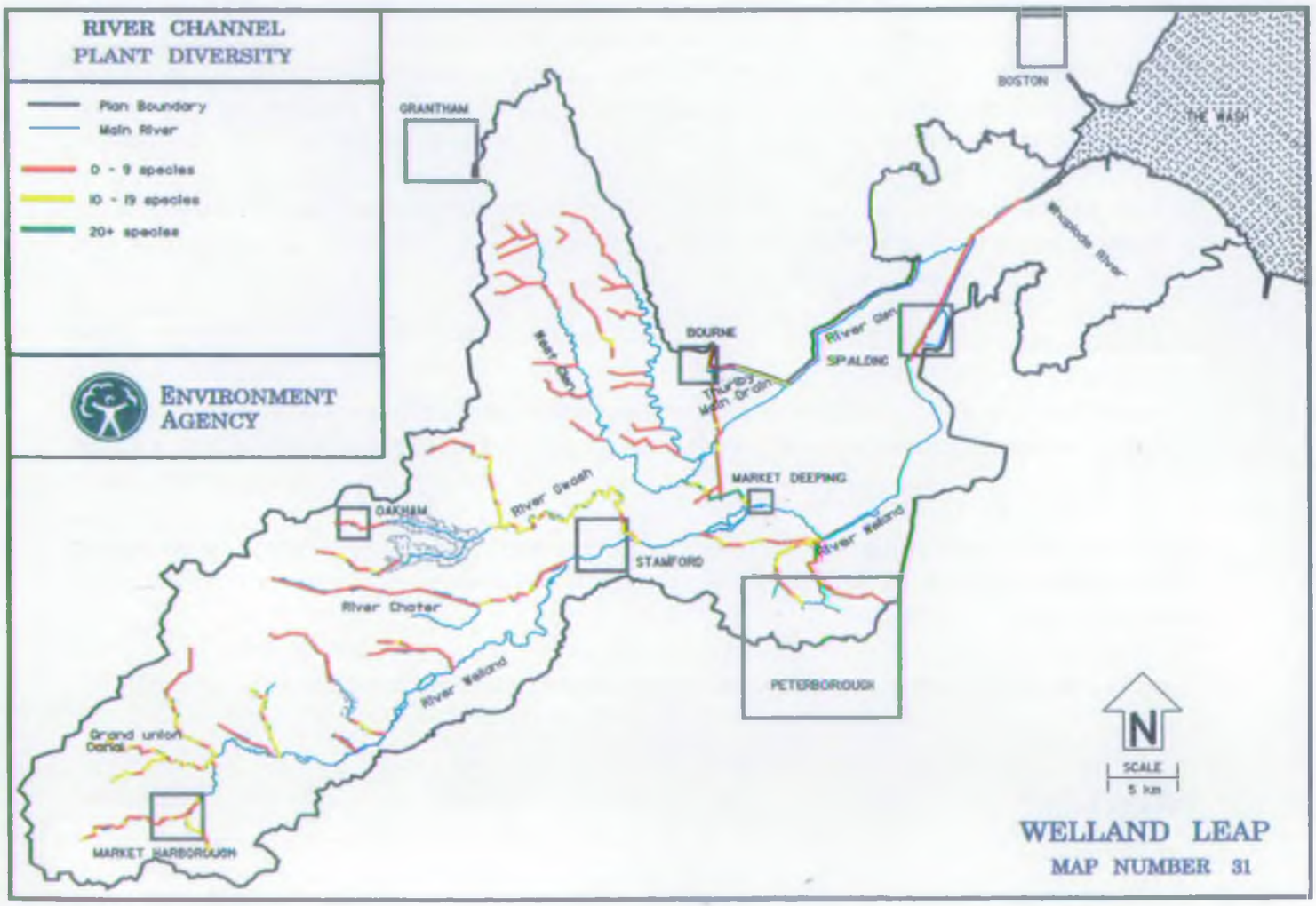
6.10.3 Targets

Our principal aim with respect to conservation is to conserve and enhance wildlife and landscape in association with inland and coastal waters, through our operational, regulatory and monitoring activities.

The River Corridor Survey methodology employs a classification system which categorises a river's conservation resource into three classes of High, Average and Low River Corridor plant species diversity.

Map Nos. 30 and 31 show River Corridor and River Channel Plant Species Diversity.


RIVER CORRIDOR
PLANT DIVERSITY
Plan Boundary
Main River
0 - 50 species
51 - 89 species
90+ species
ENVIRONMENT AGENCY
GRANTHAM
BOSTON
THE WASH
Witham River
BOURNE
River Glen
SPALDING
West Glen
Thurlby Main Drain
MARKET DEEPING
OAKHAM
River Gwash
STAMFORD
River Welland
River Chater
PETERBOROUGH
Grand union Canal
MARKET HARBOROUGH
N
SCALE
5 km
WELLAND LEAP
MAP NUMBER 30


RIVER CHANNEL
PLANT DIVERSITY
Plan Boundary
Main River
0 - 9 species
10 - 19 species
20+ species
ENVIRONMENT AGENCY
GRANTHAM
BOSTON
THE WASH
Witham River
BOURNE
River Glen
SPALDING
West Glen
Thurlby Main Drain
MARKET DEEPING
OAKHAM
River Gwash
STAMFORD
River Welland
River Chater
PETERBOROUGH
Grand union Canal
MARKET HARBOROUGH
N
SCALE
5 km
WELLAND LEAP
MAP NUMBER 31

Although targets for individual river stretches have not been established, the classification system is used in the decision making process to target resources for habitat improvements to the most needed stretches. Following the development of Local Bio-diversity Action Plans by English Nature and local Wildlife Trusts we will integrate appropriate targets into future LEAP documents.

Specific areas of concern in the area have been previously discussed in the Issues Section including, the lack of habitat diversity caused by past river management practices and low flows, and the almost complete absence of fenland habitat.**(Issues 5 and 18)**.

6.10.4 Current Status

Part of the Plan area fringes upon the Wash Estuary which is internationally important for its nature conservation value. It gains national recognition as a Site of Special Scientific Interest (SSSI) and international recognition as a Special Protection Area - SPA (EC Conservation of Wild Birds Directive 79/409) and as a Ramsar Convention Site (Wetland of International Importance). The Wash is also a proposed Marine Special Area of Conservation (SAC) under the Habitat Directive for its intertidal and subtidal sand, mud flats and grey seals.

Frampton Marsh is famous for its bird life. Large flocks of migratory wigeon use the marsh every winter as well as brent geese, teal, mallard, goldeneye and scaup, amongst others. Predatory species such as marsh harriers and short eared owls also spend the winter here.
In the summer the marsh has the largest colony of breeding black headed gulls in the U.K. The tidal mudflats of the marsh form part of the wader feeding grounds which give the Wash it's international status.

The Welland catchment has three distinctive geomorphological types which influence habitat and therefore flora and fauna: the lowland clay of the Upper Welland valley; the limestone of the Upper Glens; and the fens of the lower catchment. Remnants of fen remain behind the banks of the River Glen between Baston and Pinchbeck West. We own some of these areas of fen and borrow pits and are working in collaboration with local tenants and the local wildlife trust to maintain and enhance the conservation interest in these areas.

An important feature of the catchment is Rutland Water which was classified in 1981 as a SSSI because of it's conservation value, since then it has been designated a Ramsar site because of it's growing importance to migratory bird populations. Rutland Water is one of the most important waterfowl sanctuaries in Great Britain. The reservoir and accompanying reserve are often used by 28 species and up to 10,000 waterfowl. The commoner resident species include gadwell, shoveler (the reservoir is of international importance for these two species), teal, pochard, tufted duck and shelduck. In the colder months the residents are joined by smew, long-tailed duck and red breasted mergansers. During the spring little gulls, Arctic terns and black terns are often seen. Even rarer are the white-winged black and Caspian terns that have been recorded. Rare birds of prey include the Osprey (a species that is being encouraged to breed at the reservoir), peregrine falcons, harriers and merlins. The mixed habitat around the lake is also a summer home for many species of warbler and in 1997 contained 5 breeding pairs of nightingales.

Generally river corridor plant species diversity is low or average within the catchment. The Welland in particular has suffered as a consequence of flood defence activities over the last century **(Issue 18).** Today only short lengths of river have high corridor plant species diversity; along the Gwash, Chater and Welland downstream of Stamford. 'River Corridor Surveys' also indicate that river channel plant species diversity is generally low throughout the catchment (less than 10 aquatic species per 500m), apart from the remnants of high aquatic plant diversity that remain in the fen communities along the River Glen.

In this Plan area, otters and water voles are present with both being national priority species for Biodiversity Action Plans. Locally important species include kingfishers, snipe and water shrew. Action to protect and conserve individual species such as otters which involves the restoration of habitat can often benefit a wider range of species such as dragonflies.

In addition to our own survey work we have commissioned the Wildlife Trust for Northamptonshire to complete an assessment of the state of the River Welland and produce an environmentally based vision of future management opportunities for the Welland valley. The report which came out from this work called " The River Welland -A vision for the Flood Plain" - lists the remaining 63 wildlife sites in the valley and some broad scale restoration proposals. Our next step is to work in partnership with landowners and the Farming and Rural Conservation Agency to develop specific site restoration management plans.

Biodiversity Plans

Local Biodiversity Audits are being prepared for the catchment by local Wildlife Trusts and Local Councils. Following these Audits, Local Action Plans will be produced and implemented to protect and enhance the biodiversity resource of the area. Nationally we have been given responsibility as a contact point for the following 12 species, and Chalk Rivers Habitat.

water vole	*Arvicola terrestris*
otter	*Lutra lutra*
vendace	*Coregonus alba*
atlantic stream crayfish	*Austropotamobius pallipes*
southern damselfly	*Coenagrion mercuriale*
depressed river mussel	*Pseudanodonta complanta*
shining rams horn snail	*Segmentina nitida*
snail	*Anisus vorticulus*
glutinous snail	*Myxas glutinosa*
freshwater pea mussel	*Pisidium tenuilineutum*
river jelly lichen	*Collema dichotomum*
ribbon leaved plantain	*Alisma gramineum*

Local biodiversity plans will also consider species that have been identified as being local priorities such as palmate newts, brown trout, the great crested grebe and curlew.

Mammals and birds tend, by their nature, to have a higher profile in the public eye when it comes to protecting and conserving species. In this catchment otters and water voles are national

priority species with a high profile and local priority species include kingfishers and snipe. Action to protect and conserve individual species such as otters involving the restoration of habitat can often benefit to a wider range of species such as dragonflies, damselflies and water shrews.

The status of native crayfish in the middle reaches of the Welland is a particular concern of ours. It's status is threatened by the non-inclusion of this area in the protection afforded to crayfish by recent changes to the law, the inclusion of the PE9 postal district in the new act is essential (**Issue 7**)

6.10.5 Trends

The River Welland and tributaries have undergone considerable change over the last 50 years. Major engineering works have straightened and deepened the watercourses resulting in the loss of meanders, pools, riffles and bank side trees. To a certain extent this is typical of the entire catchment, with all rivers having undergone some drainage improvements. Simultaneously more intensive farming, which became possible with land drainage improvements, has resulted in increased use of pesticides and fertilisers and has increased the silt load of rivers. These factors along with the growing use of water for irrigation purposes have impacted significantly upon on the local flora and fauna.

This trend is typified by the loss of Barrowden Glebe Meadows SSSI and associated birds such as breeding snipe, redshank and wetland plants as a consequence of the nutrient enrichment of the Welland.

In recent years perceptions and attitudes are starting to change, benefitted by the introduction of various habitat restoration schemes by MAFF, changing philosophies on land drainage practices and growing public concern for environmental issues.

6.11 FRESHWATER FISHERIES

6.11.1 General

The Environment Agency has a specific duty to assess the state of, and safeguard, freshwater fisheries and the waters which they inhabit. Under Section 6 of the Environment Act 1995 we have a duty to maintain, develop and improve fisheries.

6.11.2 Monitoring

We monitor the state of fisheries by sampling freshwater fish populations on a regular basis. A programme of population surveys assesses the fisheries in certain rivers, on a five yearly basis, in terms of fish biomass (the weight of fish found for a given area of water surveyed), species richness, (the number of fish species found for a given area of water surveyed) and age structure. This is part of the National Fisheries Classification system which allows fisheries throughout England and Wales to be compared in a standard way, taking into account broad habitat types.

We also carry out chemical water quality monitoring, on a monthly basis, in association with the EC Freshwater Fish Directive (78/659/EEC).cross ref WQ section

6.11.3 Targets

Our principle aim with respect to fisheries is to maintain, improve and develop fisheries.

The national fisheries classification system grades fish population according to:

a) Biomass
b) Species richness

with categories for both from A to F. The system takes into account the relative habitat value of the rivers including its gradient and width (see **Appendix 12**)

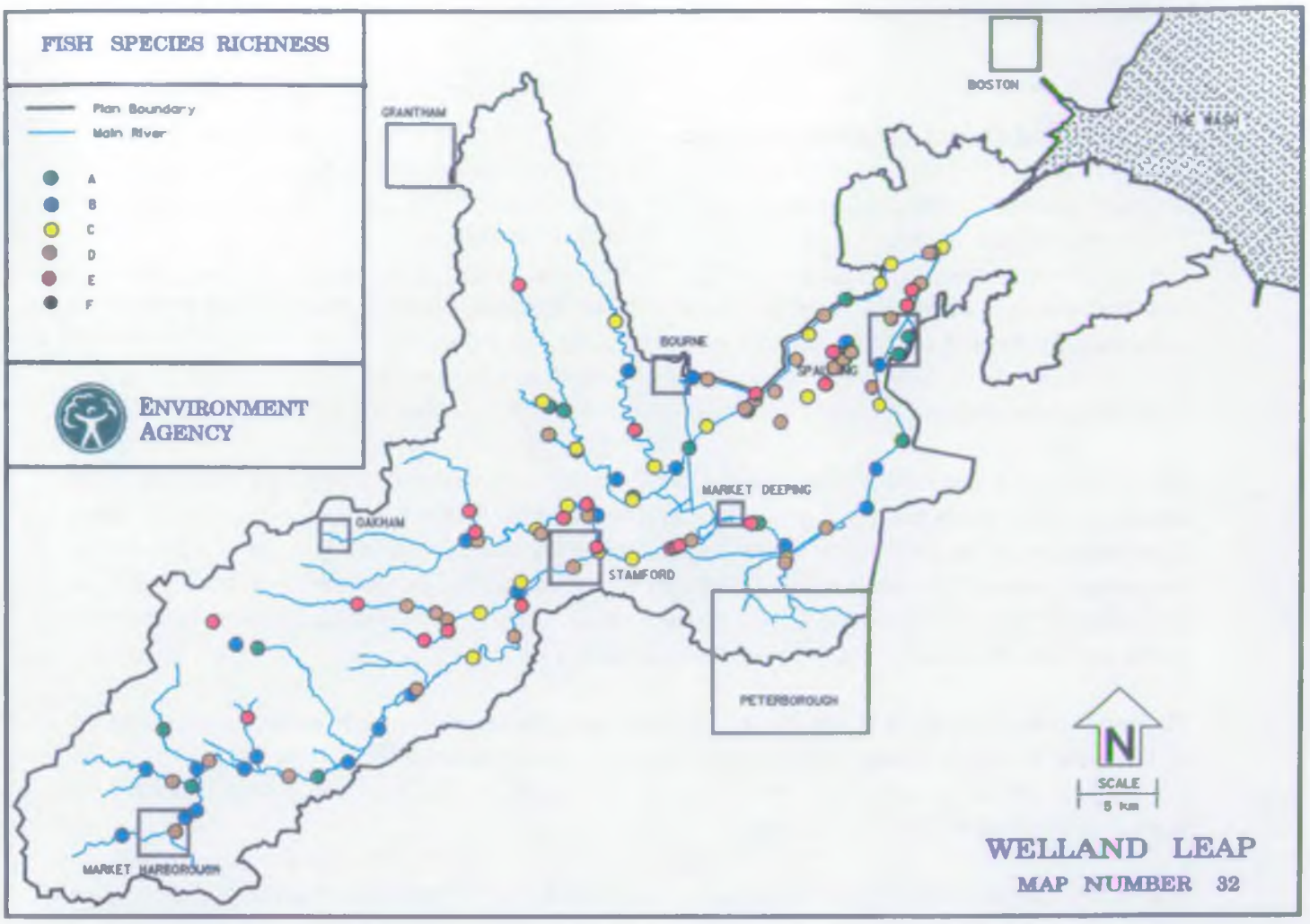
Certain species of fish in the catchment are listed in the *EC Habitats Directive (92/43/EEC)* (examples, spined loach, allis shad, twaite shad, salmon, brook, river & sea lamprey, bullhead) and require special protection. Any damage to their resting places or breeding sites is illegal.

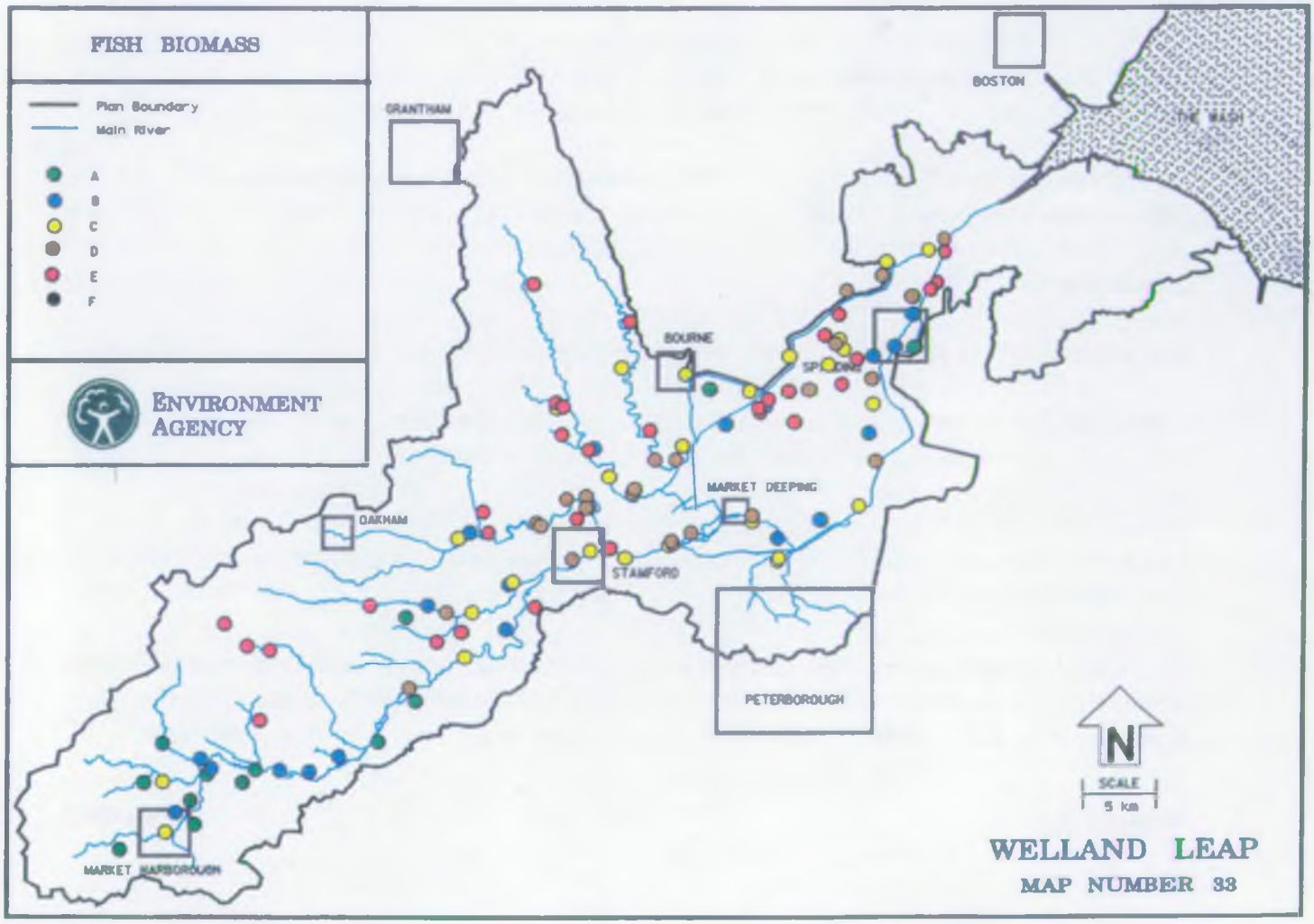
Water quality objectives setting out standards for fisheries are discussed at **Appendix 8**

6.11.4 Current Status

Map Nos. 32 and 33 show Fish Species Richness and Biomass in the Plan area.

The River Welland, from its source to the tidal reaches holds some very good fish stocks. Near the source in Northamptonshire are many small brooks which all contain brown trout (in very small numbers). Below Market Harborough the river holds good chub, dace and roach and further downstream at Harringworth, the river is stocked as a brown trout fishery. The upper


FISH SPECIES RICHNESS
Plan Boundary
Main River
A
B
C
D
E
F
ENVIRONMENT AGENCY
BOSTON
THE WASH
GRANTHAM
BOURNE
SPALDING
MARKET DEEPING
OAKHAM
STAMFORD
PETERBOROUGH
MARKET HARBOROUGH
N
SCALE
5 km
WELLAND LEAP
MAP NUMBER 32


FISH BIOMASS
Plan Boundary
Main River
A
B
C
D
E
F
ENVIRONMENT AGENCY
BOSTON
THE WASH
GRANTHAM
BOURNE
SPALDING
MARKET DEEPING
OAKHAM
STAMFORD
PETERBOROUGH
MARKET HARBOROUGH
N
SCALE
5 km
WELLAND LEAP
MAP NUMBER 33

river is fished mainly for roach and chub during the winter months as weed makes angling difficult in the summer. Despite the fact that the river's habitat diversity has suffered from land drainage practices **(Issue 18)** there are still some superb reaches in the Collyweston and Duddington areas with gravel riffles, glides, pools and meanders.

The fenland area of the Welland is popular for matchfishing, and the wide slow moving river holds good shoals of common bream along with many large pike and tench. In surveys, twenty species of fish have been recorded from the Welland and the average mean biomass of fish is approximately 20 gms / m2, which is a fairly good quantity of fish for a river system.

The factor that affects the Welland's fisheries most severely is the water resource situation. The recent drought years have had a substantial impact on all sections of the river, reduced flows causing problems to all types of fisheries throughout the length of the river. Decreased flow has lead to siltation and the drying of the runs where gravel spawning species such as dace and trout deposit their eggs. This leads to the intersticies in the gravel becoming blocked by fine silt particles which causes the eggs to suffocate and die.

The trout fishery on the R. Gwash is being affected by reduced flows. Prior to the construction of Rutland Water, the river enjoyed approximately twice the supply of water it receives now. This reduced flow is causing a ' narrowing ' of the stream, by the accumulation of silt banks on one or both sides of the river. **(Issue 4)**

The R. Chater still holds small numbers of grayling, but these are declining in number. Again low flows may well be responsible, as spawning runs are blocked by silt.

A recent fisheries report for the Welland highlighted a decline in fish stocks in the middle river, from Harringworth downstream to Stamford. This also coincides with a decline in water quality which has been picked up by invertebrate monitoring.

Further downstream, the Maxey Cut suffers a shortage of water during most summers. This has lead to regular fish rescues due to fish becoming stranded in pools. The Maxey Cut is no longer considered a viable fishery by the local angling club and is not leased as a fishery at present. **(Issue 20)**

This same shortage of water (coupled with highly eutrophic conditions and high temperatures) results in heavy algal growth in the lower river. This algae has caused some small scale fish mortalities, but its main effect is that of causing disruption to anglers, boaters and flood defence engineers; whilst having a generally debilitating effect on the ecology of the river.

In recent years there has been a decrease in the elver run in the Welland (the inland migration of young eels), this has been caused by a number of environmental factors particularly the lack of flow which means that the tidal doors are nearly always shut during the time of the elver run.

Similarly the water resource problem is causing a shortage of flushing water in the South Holland Main Drain. This allows saline water from the River Nene to penetrate far upstream in the South Holland. This has caused the loss of the coarse fishery in the lower 10 kms of the drain.

7.0 REGULATORY FRAMEWORK

This section summarises the Regulatory Framework under which the Agency and others operate for the uses and activities set out in Section 5.0. It also sets out in general terms the roles and responsibilities of relevant organisations where appropriate.

7.1 Development and Land Use Planning

The control of development is the responsibility of local government under the Town and Country Planning process. It is the Government's intention that development will be led by Plans which set out policies against which the Planning Authorities consider development proposals. Guidance for future development is contained in Regional Planning Guidance, County Structure Plans, Unitary Plans, Minerals & Waste Local Plans and District Local Plans. Regional Planning Guidance and Structure Plans set out the framework for development and Local Plans provide the details.

The Department of the Environment (DoE) issue Planning Policy Guidance notes (PPGs) to provide advice to Local Planning Authorities (LPAs) on key areas of interest. The advice contained in PPGs is an important material consideration for LPAs in the preparation of Development Plans and the determination of individual planning applications. The principal PPGs relevant to the interaction between land use planning and the environment are:

PPG1	General Policy and Principles
PPG7	The Countryside, Environmental Quality and Economic Development
PPG9	Nature Conservation
PPG12	Development Plans and Regional Policy Guidance
PPG23	Planning and Pollution Control

The DoE also issue advice to LPAs in the form of Circulars. Circular 30/92 on Development in Flood Risk Areas sets out the type of information which this Agency should provide LPAs on flood plain areas and areas at risk from flooding and the weight which LPAs should give to our advice regarding proposed development in those areas.

We are a statutory consultee under planning legislation and advise County and Local Authorities on development proposals which may have an effect on matters relevant to our interests. The Agency's purpose in this participation is the protection of the environment and the prevention or mitigation of any adverse effects associated with development and land use change. It must be remembered however that the final decision on planning matters rests with the planning authorities.

7.2 Agriculture and Forestry

The Ministry of Agriculture Fisheries and Food (MAFF) play the leading role in the regulation of the agriculture industry. They promote a number of measures to encourage farmers to conserve and enhance the rural environment and its natural resources, including the water environment. Amongst these measures, the designation of Nitrate Sensitive Areas (NSA) and

Nitrate Vulnerable Zones (NVZ) are specifically aimed at protecting water from nitrate contamination. The Environmentally Sensitive Area (ESA) scheme promotes farming methods which protect and enhance wildlife, landscape and historic features. Other schemes include:

- *The Habitat Scheme* which was introduced to encourage farmers to create, protect or enhance a range of wildlife habitats by managing land in an environmentally beneficial way. A requirement of the habitat scheme is that land is kept out of agricultural production for 5 years;

- *The Countryside Access Scheme* is open to farmers who have non-rotational set aside land. It is designed to provide new opportunities for public access and recreation and could include access to watercourses;

- *The Countryside Stewardship Scheme* encourages farmers to manage waterside land in a way sympathetic to wildlife and fisheries.

Our powers with respect to agriculture stem from:

- *The Water Resources Act 1991* which gives us certain powers to control pollution from agricultural sources;

- *The Control of Pollution (Silage, Slurry and Agricultural Fuel Oil) Regulations 1991* which enables us to prevent pollution from certain agricultural practices;

- *The Waste Management Licensing Regulations 1994* which enables us to control land spreading of certain wastes;

- *The Land Drainage Act, 1991* which enables us to influence proposals relating to the drainage of land.

The **Forestry Authority** are responsible for the regulation of forestry and have published a series of guidelines which seek to minimise the adverse impact of forestry operations, including the encouragement of environmentally sympathetic planting.

7.3 Air Quality

In 1863 the Alkali Act was the first legislation to be introduced to control releases to air from industrial sources in the United Kingdom. The principles embodied in this Act carried forward over many years but with additions to the number and variety of industrial processes regulated. This applied to releases to air only. In response to a report by the Royal Commission on the Environment, the government introduced the concept of Integrated Pollution Control (IPC) as embodied in the Environment Protection Act (EPA) 1990. This widened the scope of pollution control to that controlling releases of certain pollutants from certain processes to all media.

The requirement of Part One of the EPA90 is to use Best Available Technique Not Entailing Excessive Cost (BATNEEC) to prevent, minimise and render harmless prescribed substances considered to be of most environmental concern as listed in the Environment Protection (Prescribed Substances and Processes) Regulations 1991: SI 472, as amended. Another requirement is due regard to the Best Practical Environment Option (BPEO) if the release can impact on different media. The key part of controlling IPC processes is the precautionary principle - to try and prevent the release in the first place.

SI 472 as amended, also details those processes that come under EPA90. Part A processes, considered to have the greatest polluting potential, come under central control and are regulated by the Agency. These processes include large combustion plant, iron and steel making, the chemical industry, solvent recovery and incineration plants.

The legislation also considers a range of processes which are considered to be less polluting. These Part B processes are regulated by the relevant local authority and only the releases to air are controlled. Examples of Part B processes are paint spraying, small foundries and small combustion plant. Generally, those industrial processes that are not defined as Part A nor Part B are controlled for releases into air by regulations under the Clean Air Act 1993 or under part 3 of the EPA90 : Statutory Nuisance Regulation.

The Department of Transport (DTp) sets vehicle emission standards for enforcement by others such as the Police. These standards also impact upon vehicle manufacturers.

7.4 Water Quality

The Water Resources Act 1991 (as amended by the Environment Act 1995) enshrines previous pollution control legislation including the Control of Pollution Act 1974 and the Water Act 1989.

The Environment Act 1995, the Act that saw the creation of the Environment Agency, supplements and amends various aspects of the Water Resources Act 1991, introduces new duties and powers and passes the powers of the NRA in respect of existing pollution control legislation the Agency.

The Agency controls all discharges of domestic sewage and most industrial effluents are regulated under the above legislation by issuing and enforcing permissions (discharge consents/notices). Permissions specify limits on the quality and quantity of material which may be discharges. Discharge conditions are based on the upstream water quality and dilution available in the receiving watercourse.

Other legislation gives the Agency powers in respect of applications for planning permission and pollution prevention. Some industrial processes which discharge to water are controlled under the Environmental Protection Act 1990, under a regime of Integrated Pollution Control.

Significant European legislation relevant to the Plan Area includes:

The EC Urban Waste Water Treatment Directive seeks to protect the environment from the adverse effects of urban wastewater discharges and discharges from certain (organic) trade discharges. The Directive requires the provision of sewerage systems and defines minimum levels of treatment and effluent standards for sewage treatment works. The specific requirements are complex and depend on the size of the discharge, the type of receiving waters (freshwater, estuary, coastal waters) and the sensitivity of those waters.

The EC Dangerous Substances Directives sets out a framework for measures to control water pollution caused by discharges of certain dangerous substances. The Directive defines two lists of substances which require special control because they are toxic, accumulate and concentrate in plants and animals (List I) and a separate list (List II) of substances that are less dangerous, but may still have a deleterious effect on the aquatic environment. Separate Directives set quality objectives for individual List I substances. Quality objectives for List II substances are set by individual member states.

The EC Surface Water Abstraction Directive seeks to protect public health and ensure against deterioration in water quality where surface water is abstracted for potable supply. The Directive describes three classes of surface water, dependent on the degree of treatment that the water receives before it enters the potable water supply. water quality standards apply to designated surface water abstraction points.

The EC Freshwater Fisheries Directive is primarily for the protection and protection of fish ecosystems. The Directive describes two classes of water which can support salmonid or cyprinid fish. Water quality standards for these two classes are based on research carried out by the European Inland Fisheries Advisory Commission in the 1960's and 70's. The standards apply only to stretches designated under the Directive.

The EC Nitrates Directive seeks to reduce or prevent pollution of water caused or induced by nitrate from agricultural sources. The intention is to address two problems (i) pollution of drinking water by nitrate and (ii) eutrophication in saline waters (eutrophication in these waters is normally nitrate limited). One of the aims is to provide all waters with a general level of protection against nitrate pollution, through encouraging good agricultural practice. In addition, specific areas may be designated as Vulnerable Zones (areas of land draining to waters particularly affected by nitrate pollution), where more rigorous protection is afforded.

The EC Protection of the Quality of Groundwater Directive prohibits the direct or indirect discharge into groundwater of List I substances and limits List II substances, unless prior investigation can establish that pollution of groundwater will not occur, or unless the groundwater is permanently unsuitable for other uses.

7.5 Waste Management

Section 42 of the Environmental Protection Act 1990 requires the Agency to licence and supervise licensed waste management activities to prevent pollution of the environment, harm to human health and detriment to the local amenity.

This legislation which controls the treating, keeping or disposal of waste, applies to waste produced by households, commerce and industry. It also includes that waste going to transfer stations, recycling centres and treatment plants. It is only under exceptional circumstances that waste is disposed of directly into or onto land. Usually a protective barrier is required between waste and land.

In general, waste not regulated by ourselves includes waste from mining and quarrying operations and waste from premises used for agricultural purposes. New regulations are proposed which may bring a degree of regulation over these wastes.

The Landfill Tax was introduced in 1996 with the intention to direct away from landfill, to options such as recycling and minimisation. This has raised speculation that it could cause an upturn in fly tipping. The Duty of Care regulations place a duty on anyone from producer to disposer to ensure that waste is handled safely and legally.

Under the *Waste Management License Regulations 1994*, liquid industrial wastes which can be shown to benefit agriculture may be deposited on land, subject to our approval and written consent. Sewage sludge may be deposited on land under the above regulations or under the *Sludge (Use In Agriculture) Regulations 1988*, also enforced by ourselves.

Other relevant legislation includes:

- The Control of Pollution (Amendment) Act 1989
- The Environmental Protection Act 1990
- The Controlled Waste (Regulation of Carriers and Seizure of Vehicles) Regulations 1991
- The Environmental Protection (Duty of Care) Regulations 1991
- The Controlled Waste Regulations 1992
- The Waste Management Licensing Regulations 1994
- The Environment Act 1995
- The Special Waste Regulations 1996

In addition the use of regulatory standards by Government has enabled certain disposal options to be made more expensive and thus concentrate the producer's mind to eliminate or reduce the amount of waste he produces. This use of law to increase regulatory standards for certain disposal methods (eg landfill), and hence to increase costs, as with that associated with the new producer packaging regulations, is being utilised by Government as a mainstay waste management strategy. At the European level the development of tighter standards for urban waste water treatment which will preclude the dumping of sewage sludge at sea, is also part of the same trend to use regulatory standards to direct waste and encourage waste reduction and recycling.

7.6 Mineral extraction

In January 1988, the Department of the Environment introduced a new series of Minerals Planning Guidance (MPG) dealing with the control of minerals development. MPGs are the main source of national policy guidance on mineral planning matters. MPG 6 provides advice to mineral planning authorities and the minerals industry on how best to ensure that the construction industry receives an adequate and steady supply of material at the best balance of social, environmental and economic costs. This ensures that extraction and development are consistent with the principles of sustainable development.

Structure Plans and Minerals Local Plans are prepared by the County Councils, under the Town and Country Planning Act 1990, in accordance with Planning Policy Guidance Note 12. These provide the policy framework within which proposals for mineral working are assessed. They guide the minerals industry and the public as to how much extraction is to be permitted, where it might occur and what conditions will be imposed on any planning permissions. They also aim to steer development to the least environmentally damaging areas. As a statutory consultee, we make comment upon these Plans to ensure our interests are protected.

MPG6 states that mineral planning authorities should take into account the need to protect the flow, level and quality of surface waters and groundwater to ensure that changes in the water table as a result of mineral extraction do not cause environmental damage or adversely effect water resources. Our 'Policy and Practice for the Protection of Groundwater', addresses matters relating to mineral extraction.

Under the Water Resources Act 1991, dewatering of mineral workings is exempt from the need to obtain an abstraction licence. However, under Section 30 of the Act, the Agency can issue a 'Conservation Notice' to the mineral extraction company, in order to conserve water in the dewatering process. These powers are limited and cannot be used to prevent mineral extraction.

7.7 Water Resources

The Water Resources Act 1991 sets out our duties with respect to the management and development of water resources. Under this legislation we have a duty, and the powers, to take such action as we consider necessary to conserve, redistribute, augment and secure proper use of water resources, taking into account the needs of the environment.

This is achieved by administering a system of licensing abstractions and impoundments and by developing river transfer schemes as appropriate. We have powers to decide whether or not a licence may be granted, the conditions applied to it, and the power to vary licences.

Apart from a few exceptions all abstraction of water whether from ground or surface waters is required to be licensed by ourselves to ensure the balanced and sustainable use of resources. The abstraction and/or impoundment of water without a licence is an offence which we are responsible to enforce.

The Agency may apply to the Secretary of State for drought orders, which enable it to take measures to cope with water shortages such as modifying abstraction licences. Drought orders may involve payment of compensation to affected parties however we may restrict abstraction for spray irrigation licences without compensation.

7.8 Land Drainage and Flood Defence

The Ministry of Agriculture Fisheries and Food (MAFF) have overall responsibility for Flood Defence policy in England and Wales which is to :

> "reduce risks to people and the developed and natural environment from flooding, by encouraging the provision of technically, environmentally and economically sound and sustainable defence measures."

The Ministry seeks to achieve this by establishing a policy framework for the responsible organisations such as the Agency to provide flood warnings and to carry out maintenance and improvement works, and by the provision of grant aid for cost effective flood defence works and warning systems.

The Water Resources Act 1991 sets out responsibilities for land drainage and flood defence matters. Our duties are as follows:

- to exercise a general supervision in all matters relating to flood defence;
- to carry out surveys to ascertain the flood defence needs of any area;
- in the carrying out of our functions to promote the maintenance and enhancement of the environment.

We are also a statutory consultee in the Town and Country Planning process which enables the Agency's views and advice to be taken into account by the Local Planning Authority when considering applications which might affect or be affected by the risk of flooding.

7.9 The Natural Environment

The Water Resources Act 1991 sets out our responsibilities and powers in respect of the natural environment. We have a duty when exercising all our functions to promote and further the conservation of flora and fauna. In formulating our proposals or considering proposals from other parties, we must take into account:

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

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

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

The Environment Act 1995 reiterates these points stating that we have "a duty ... generally to promote, the conservation and enhancement of the natural beauty and amenity of inland and coastal waters and the land associated with such waters, [and] the conservation of flora and fauna which are dependent on an aquatic environment."

The Habitat Directive and Regulations

The Habitats Regulations 1994 are the instrument by which the EU Habitats Directive 1992 is implemented. The Regulations effectively amend all previous legislation so that all local and national competent authorities are obliged to exercise their functions to meet the requirements of the Directive in relation to marine Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) under the Birds Directive.

The requirements of the Directive can be summarised as:

- Requiring that sites are managed to contribute the maintaining or restoring the favourable conservation status of their habitats or species.

- Avoiding the deterioration of habitats, habitats of species or disturbance of species for which the site is designated.

- Plans or projects inside or outside SACs which are not necessary for the management of the site and likely to have a significant effect on the conservation status of the sites features shall be subject to an appropriate assessment and only proceed if they will not adversely affect the conservation features of the site and there are no alternative solutions. Activities affecting the site shall be subject to appropriate management.

- Competent Authorities are required to use their powers to ensure the protection of the site and review all outstanding planning permissions or consents in this light.

- A programme of monitoring will be undertaken at each site to ascertain the condition of the conservation features and assess the effectiveness of management measures.

The Regulations also state that management schemes may be established for marine SACs. They also imply that Relevant Authorities should work together, ideally within a management group to develop a single scheme. The Regulations also give the powers to Ministers to direct Relevant Authorities in the production of the scheme.

The implication of this Directive for ourselves is that we shall be obliged to review all our consents and permissions because of their potential impacts upon Rutland Water and the Wash.

7.10 Commercial Fisheries

The Salmon and Freshwater Fisheries Act 1975 (Section 25) sets out responsibilities for the regulation of commercial fishing for eels, salmon and migratory trout in all waters.

The licensing of commercial fish farming in Britain is undertaken by MAFF who regulate the movement of fish and eggs onto or off the farm premises. Our consent is required to release fish into any river or still water that is not a MAFF registered fish farm.

Commercial eel fishing upstream of tidal demarcations is regulated by a system of licensing. It may only be conducted with the permission of the owner or controller of the fishing rights, and in accordance with the *Anglian Region Fisheries Byelaws.* Seawards of the demarcation points, eel fishing is excused from licence duties and is effectively free of any constraints or regulations.

7.11 Recreational Fisheries

The Water Resources Act 1991, and in other National and European Community (EC) legislation sets out our responsibilities for recreational fisheries. Under this legislation we have a general duty to maintain, improve and develop salmon, trout, freshwater fish and eel fisheries under our jurisdiction and a more general duty to further the conservation of flora and fauna, which is important for bank-side and in stream habitats.

Under *the Salmon and Freshwater Fisheries Act 1975 and Byelaws* we have a duty to regulate the taking of salmon, trout, freshwater fish and eels by rod and line for recreational (or commercial) purposes, by means of a system of licensing. We also have powers to help ensure the unobstructed migration of salmon and sea trout between the sea and their spawning grounds. These include the power to require the construction of fish passes on weirs or other dams.

The Agency must notify the Ministry of Agriculture, Fisheries and Food (MAFF) of occurrences of fish disease in waters other than fish farms, and have the power to remove dead or dying fish

from waters (other than fish farms). Our consent is required for the introduction of fish or spawn into any waters other than fish farms.

Freshwater anglers require permission to fish from the owner or controller of the fishing rights on watercourses. Angling for brackish or salt water species in estuaries and coastal waters is not regulated by licensing or other means, although certain byelaws enacted by various statutory bodies can impinge on its conduct. Netting or trapping does require a licence. There is a public right to fish in virtually all tidal waters, which was established by *Magna Carta*.

7.12 Landscape and Heritage

The principle legislation affecting monuments in England is contained in the *Ancient Monuments and Archaeological Areas Act 1979*, which was subsequently amended by the *National Heritage Act 1983*. Scheduled Ancient Monuments are designated by the Department of National Heritage on advice from English Heritage development and hence afforded statutory protection through the planning process.

Under the 1995 Environment Act we have, in all our work a duty to "further the conservation and enhancement of natural beauty and geological or physiological features of special interest"

7.13 Recreation and Amenity

Under the Water Resources Act 1991 our statutory duties are set out to include:

- to take account of recreation in the performance of our functions in terms of preserving and maintaining access for the public to places of natural beauty and to buildings of historical interest;

- to ensure that water and land under our is made available for recreational purposes (taking into account the needs of persons who are chronically sick or disabled).

We are also able to make byelaws to regulate or prohibit boating and recreational activity on land and waters that it owns or manages and also on inland water where a right of navigation exists but where there is no controlling authority.

7.14 Radioactive Substances

The Radioactive Substances Act 1993 (RAS93) sets out the legislation with respect to radio active substances. We have a duty that requires regulatory assessment of radioactive substances. This controls the keeping, use and disposal of radioactive substances. We are also the body currently charged with regulating such uses and with the keeping, use and disposal of radioactive substances and in particular the regulation of radioactive waste.

We implement (RAS93) by issuing registrations to keep and use radioactive materials and authorisation for accumulation and disposal of radioactive waste. In the context of radioactivity, the guiding principle in minimising risk from exposure to radioactivity is to ensure the levels of

activity used are "as low as reasonably achievable (ALARA)" and the use is justified in relation to the benefit conferred. Because radioactivity can be measured accurately in very low concentrations, the standards to be achieved are high.

For nuclear sites there are direct consultations with the Nuclear Installation Inspectorate (NII) and the Ministry of Agriculture, Fisheries and Food (MAFF). We work closely with NII to ensure that Government policy objectives for radioactive waste management are achieved. NII use their powers to prevent construction or modification that would not satisfy our requirements. We consult both MAFF and NII when setting authorisations so that these take account of implications arising from the increased storage of nuclear waste on-site.

APPENDIX 1

THE GENERAL QUALITY ASSESSMENT SCHEME (GQA)

The GQA scheme replaces the National Water Council (NWC) scheme and is used to make periodic assessments of the quality of water in the catchment and enables us to report changes over time.

Chemical quality, of course, is not the only indicator of water quality. In the future, GQA assessments will also be made on the biological, aesthetic and nutrient status of such waters. We refer to these different aspects as 'windows' because each offers a different perspective on the overall health of the river.

The criteria for deciding which watercourses to include for GQA monitoring include river flow, position of tributaries and the presence of major discharges.

Chemistry GOA

The Chemistry Window has already been produced and comprises six water quality grades:

A, B	Good
C, D	Fair
E	Poor
F	Bad

The chemical scheme - to provide continuity with previous schemes - is based on Biochemical Oxygen Demand and ammonia.

Table 1.1: General Water Quality Assessment: Chemical Grading for Rivers and Canals

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

* as suppressed by adding allyl thio-urea

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

Chemical samples are taken on a monthly basis, at intervals of about 5 to 8 km on all classified stretches. Retrospective river quality assessments using the GQA scheme have been made based on measurements taken since 1988.

Biological GQA

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

However, rivers vary in their size, flow and in the background geology and topography. This means that the life found in rivers varies even when pollution is absent. It is useful, therefore, to describe the biology in terms of a shortfall from that expected under conditions of natural water quality. Damage to the biota can be assessed by comparing the actual biology with the biology predicted for natural conditions of water quality.

The DoE funded the development of a mathematical model that predicts the macroinvertebrates which should be found in a clean river. The model is called RIVPACS, an acronym for River Invertebrate Prediction and Classification System. RIVPACS was developed by the Institute of Freshwater Ecology.

If the BMWP predicted by RIVPACS is higher than the observed BMWP value the results suggest that some form of pollution has occurred. RIVPACS has been used to develop a Biological GQA classification scheme.

Although a GQA equivalent biological survey has been carried out every five years since 1970, a new system of biological quality classification has been developed for the 1995 GQA survey, so that in 1995, for the first time, the annual biological survey has formally formed part of the General Quality Assessment (GQA) of the waters of England and Wales.

A site is placed in one of six classes, a to f. The classes are assigned on the basis of the ratio of observed and predicted ASPT and Number of Taxa, and provides a general statement as to the biological quality of rivers. Table 1.2 illustrates this.

Table 1.2: Biological GQA Classification

Biological GQA Classification			
	Biological Class	Ratio ASPT	Ratio Taxa
a	Excellent	> 1.0	> 0.85
b	Good	0.90	0.70
c	Moderate	0.77	0.55
d	Fair	0.65	0.45
e	Poor	0.50	0.30
f	Bad	<0.50	<0.30

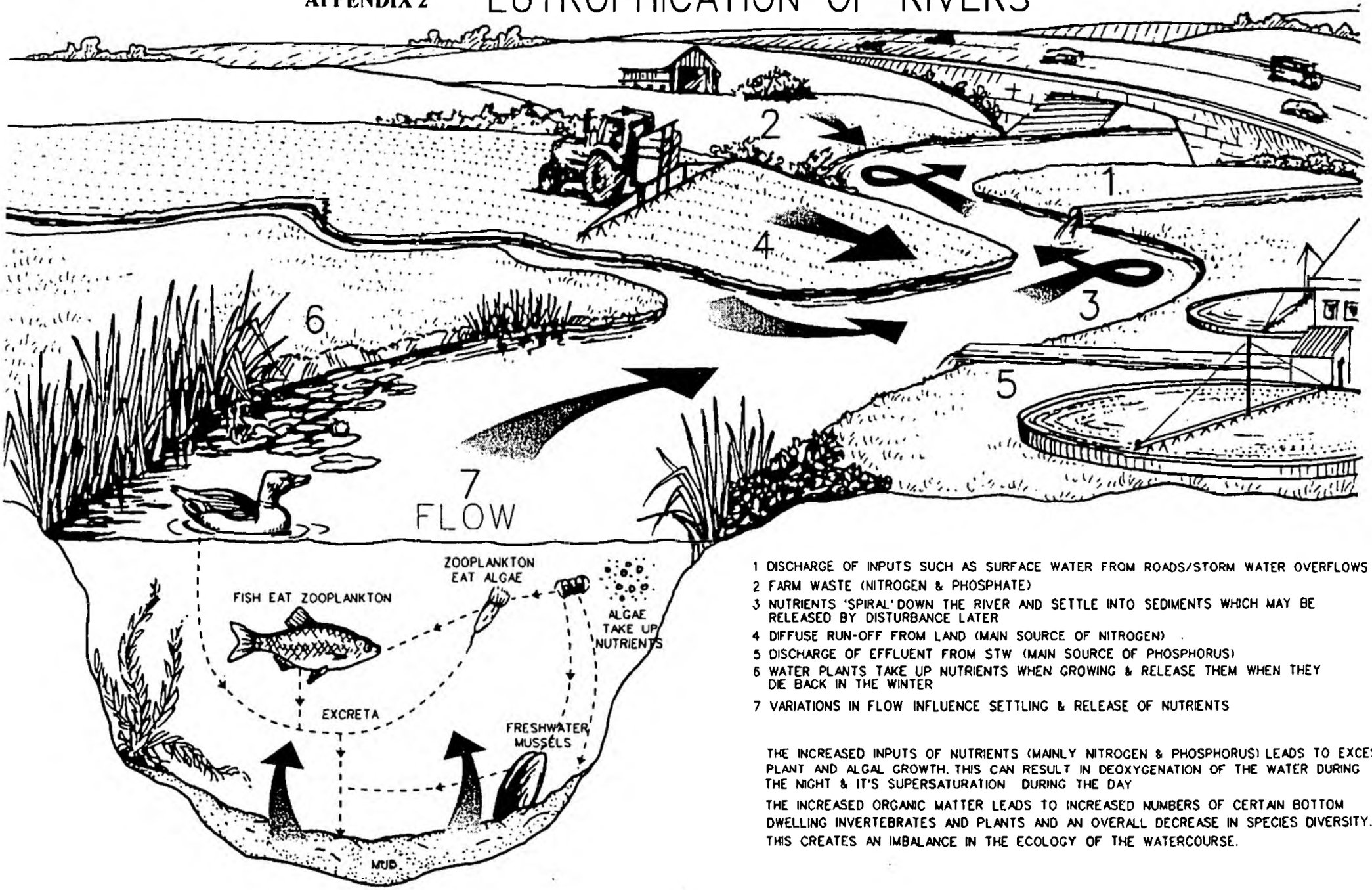
During 1995, two biological samples were taken at each site (matched with chemical sites by stretches), one in spring and one in autumn.

Nutrient & Aesthetic GQA

Formal schemes to implement both nutrient and aesthetic GQA components of the GQA are currently being developed. Further details are available in an Environment Agency R & D Report entitled Development and Testing of General Quality Assessment Schemes.

APPENDIX 2

EUTROPHICATION OF RIVERS



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

1 DISCHARGE OF INPUTS SUCH AS SURFACE WATER FROM ROADS/STORM WATER OVERFLOWS

2 FARM WASTE (NITROGEN & PHOSPHATE)

3 NUTRIENTS 'SPIRAL' DOWN THE RIVER AND SETTLE INTO SEDIMENTS WHICH MAY BE RELEASED BY DISTURBANCE LATER

4 DIFFUSE RUN-OFF FROM LAND (MAIN SOURCE OF NITROGEN)

5 DISCHARGE OF EFFLUENT FROM STW (MAIN SOURCE OF PHOSPHORUS)

6 WATER PLANTS TAKE UP NUTRIENTS WHEN GROWING & RELEASE THEM WHEN THEY DIE BACK IN THE WINTER

7 VARIATIONS IN FLOW INFLUENCE SETTLING & RELEASE OF NUTRIENTS

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

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

APPENDIX 3

WATER QUALITY OBJECTIVES - SHORT-TERM

In preparation for SWQOs, for some river stretches in our Consultation Document long-term objectives are supplemented by short-term objectives which reflect the financial constraints upon the water industry and others, and which recognise that not all improvements can realistically be achieved within the timescale of this Plan or perhaps not even within the next 10-20 years.

Short-term objectives also recognise that since we assess compliance using three years data, it may take a number of years for affected stretches to become compliant, even though water quality has improved. For example: -

> Major investment to improve the effluent quality from Tinsleys to the Whaplode River was completed in the summer of 1994. Although water quality is improving, at the moment the watercourse still does not meet its long-term objective. When the poor quality data, prior to summer 1994, is no longer included in the assessment of compliance the RE target should be met. Since for the time being compliance with the RE5 objective for BOD cannot be ensured, in the short-term it is not proposed to set an RE objective for BOD for this stretch.
>
> However we must not allow one poor quality determinand to pull down the objectives for others. Therefore for all other determinands the long-term RE objectives are met and are appropriate.

Other examples of where short-term objectives may be set are for issues such as: -

- where there is a difficult problem to solve and there are no quick or immediate answers eg. eutrophication ;
- where further investigation may be required to assess the nature of the problem;
- where over-performing discharges may put an objective at risk if effluent quality falls back to legal limits.

In these cases we are proposing short-term objectives that are less stringent than the long-term objectives. Where these two-tiered objectives are proposed, wherever possible future investment to secure compliance and/or further investigation should be viewed as a priority.

Long-term objectives will continue to form the basis for water quality planning, including the setting of consent criteria for discharges.

Tables 6.1 and 6.2 in Appendix 6 provide full details of the Agency's proposals for long-term and interim RE objectives for all classified and non-classified stretches within the catchment (non-Classified stretches are those which are biologically but not chemically monitored).

APPENDIX 4

IMPROVEMENTS PLANNED BY AWS

Second Asset Management Plan - AMP2

During 1994, the Director General of Water Services (OFWAT) set charges for the ten years 1995-2004. There will be an interim review in 1999. AWS reviewed its Asset Management Plan for these years (AMP2). AMP2 included work for environmental improvements as agreed between the NRA (now Environment Agency) and AWS.

In our discussions with AWS, we identified our requirements for sewage treatment works (STWs) and intermittent discharge. Agreed investment in this Plan Area is outlined below.

STWs

Investigations are ongoing at several STWs to establish exactly what investment will be required to meet the requirements of the UWWTD. The Agency will continue to liaise with AWS on this. To date the only firm investment obligation is to ensure compliance with UWWTD phosphate limits at Oakham STW by the end of 1998.

WTWs

Provision was included in AMP2 to make improvements to the emergency discharge and ensure compliance with legal consents to discharge at Wing WTW.

Intermittent Discharges

Several discharges were identified for improvement during AMP2 negotiations. Summary details are shown below.

Table 4.1: Discharges identified for improvement during AMP2 negotiations

Planned Improvement	Discharges
1995-2000	Peterborough Avenue, Oakham Hudds Mill, Stamford
2000-2005	St Pegas Rd., Peakirk
2005-2015	Church St., Little Bytham Intermediate, Pinchbeck Clay Lane far, Spalding Pumping stations Edenham Greetham

Following the development of AMP2, the Agency has continued to liaise with AWS over priorities for investment.

Customer Related Environment Enhancement Programmes (CREEP1 & CREEP2)

In 1995 AWS announced that £5m would be spent on environmental improvement schemes (CREEP1) aimed at improving SWSs and the performance of smaller STWs. The Agency has been involved in the prioritisation of these programmes.

Schemes included in these programmes, in the Plan area, are summarised below.

Table 4.2: Schemes in CREEP1 and CREEP2

Programme	Activity/Discharge
CREEP1	Improvements at STWs at Dingley, Glooston, Horninghold, Marston Trussel, Seaton and Welham SWS improvements at "CO-OP" SWS, Market Harborough.

In 1996 a further programme of investment, CREEP2, was announced by AWS. The provision of aerators at Rutland Water is the main water quality interest in this programme. In addition to water quality interests CREEP2 includes schemes to improve biodiversity, flow and public access and educational projects.

APPENDIX 5

CHEMICAL STANDARDS FOR 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 $CaCO_3$	(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 6

WATER QUALITY OBJECTIVES - LONG-TERM

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 we have 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.

It is worth noting that the circumstances outlined above apply to the South Drove Drain which it is felt should be classified 'upstream' of Market Deeping. This is because a new STW has been built and the pumped nature of the drain means that water may flow in either direction. Historically use-related objectives were not identified for this watercourse, upstream of Market Deeping, upon which a neutral translation to RE could be based. However chemical monitoring was put in place in 1995. A review of this data suggests that a long-term objective of RE3 is appropriate (the same as is applied to the 'downstream' stretch).

The long-term objectives proposed for the Thurlby Main Drain require special explanation. It is important that long-term objectives are realistic. We are therefore proposing determinand specific changes to the long-term objectives as shown below.

RE Determinand	**Long-term RE**
Total Ammonia	RE5
Un-ionised Ammonia	None achievable
All others	RE3

The surrounding peaty soils are naturally high in ammonia which leaches out in wet weather. The above objectives take account of what can realistically be achieved for total and un-ionised ammonia. We do not propose to change the objectives for the other RE determinands.

Tables 1 and 2 provide full details of the Agency's proposals for long-term and interim RE objectives for all classified and non-classified stretches within the catchment.

Table 6.1: Proposed WQOs - Classified Stretches

* SI = Spray Irrigation, LW = Livestock Watering, PWS(I) = Public Water Supply (Indirect), IWS = Industrial Water Supply

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

See Appendix 3

Watercourse	Stretch	Long-term RE target (** short-term target)	Additional (locally derived) use-related RQOs*
Welland	Headwaters...Husbands Bosworth	RE2 (RE3)	PWS (I) IWS LW
Welland	Husbands Bosworth..Marston Trussel Brook	RE2 (RE3)	IWS LW
Welland	Marston Trussel Brook...Jordan	RE2 (RE3)	IWS SI LW
Jordan	Jordan.....	RE3	LW
Welland	Jordan...Market Harborough STW	RE2 (RE3)	LW
Welland	Market Harborough STW...Eye Brook (1)	RE2 (RE4)	LW
Welland	Market Harborough STW...Eye Brook (2)	RE2 (RE4)	LW
Welland	Market Harborough STW...Eye Brook (3)	RE2 (RE4)	-
Eye Brook	Headwaters...Flood Storage Reservoir.	RE3	IWS LW
Eye Brook	Flood storage Reservoir...Welland	RE2	SI LW
Welland	Eye Brook...Duddington (1)	RE2	LW
Welland	Eye Brook...Duddington (2)	RE2	LW
Welland	Duddington...Tinwell P/S	RE2	PWS(I) SI LW
Chater	Headwaters...Morcott Brook	RE1	LW

Watercourse	Stretch	Long-term RE target (** short-term target)	Additional (locally derived) use-related RQOs*
Chater	Morcott Brook...Fosters Br	RE2	SI LW
Chater	Fosters Br...Welland (1)	RE1	SI LW
Chater	Fosters Br...Welland (2)	RE1	-
Welland	Tinwell P/S...Gwash	RE2	SI LW
Welland	Tinwell P/S...Gwash	RE2	SI LW
Gwash North	Headwaters...Rutland Water	RE2	PWS(I) LW
Gwash South	Headwaters...Rutland Water	RE2	PWS(I) SI LW
Gwash	Rutland Water	-	-
Gwash	Rutland Water...North Brook	RE2	-
North Brk	Headwaters...Exton Brook	RE2	LW
Exton Brk	Headwaters...North Brook	RE2	LW
North Brk	Exton Arm...Gwash	RE1 (RE3)	LW
Gwash	North Brook...Welland (1)	RE1	SI LW
Gwash	North Brook...Welland (2)	RE1	SI LW
Welland	Gwash...Folly R (1)	RE2	SI LW
Welland	Gwash...Folly R (2)	RE2	SI LW
Welland	Gwash...Folly R (3)	RE2	SI LW
Welland	Gwash...Folly R (4) the Maxey Cut	RE2	SI LW
Welland	Folly River...New River Spalding	RE2 (RE5)	SI LW
Welland	New River Spalding...Tidal Limit (1)	RE2 (RE5)	IWS SI
Welland	New River Spalding...Tidal Limit (2)	RE2 (RE5)	IWS SI

Watercourse	Stretch	Long-term RE target (** short-term target)	Additional (locally derived) use-related RQOs*
Thurlby Main Drain	Headwaters...North Drove Drain	See text above.	-
South Drove Drain	Headwaters...Deeping St. Nicholas	RE3	-
South Drove Drain	Deeping St. Nicholas...Pode Hole P/S	RE3	SI
West Glen	Burton Coggles Arm...L Bytham	RE2	LW
West Glen	Little Bytham...East Glen	RE1	SI LW
East Glen	Toft...West Glen	RE2	SI LW
Glen	East & West Glen...Kates Bridge	RE1	SI LW
Glen	Kates Bridge...Bourne Eau	RE1	SI LW
Glen	Bourne Eau...Surfleet	RE3	SI LW
Glen	Surfleet...Blue Gowt Drain	RE3	SI
Glen	Blue Gowt Drain...Surfleet Seas End Sluice	RE3	-
Whaplode R	Headwaters...Tinsleys	RE5	IWS
Whaplode R	Tinsleys...Tidal Welland	RE5 ##	IWS
Grand Union Canal	Husbands Bosworth...Foxton	RE3 (RE5)	LW
Grand Union Canal	Foxton...Market Harborough	RE3 (RE5)	LW
Grand Union Canal	Foxton...Saddington	RE3 (RE5)	LW

Table 6.2: Proposed WQOs - 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 intends to consult on proposals for RE targets.

* SI = Spray Irrigation, LW = Livestock Watering

Watercourse	Stretch	Long-term (LT) RE target	Locally derived use-related WQOs
Marston Trussel Brook	Marston Trussel Brook....	RE4	LW
Dingley Brook	Headwaters...R Welland	RE3	LW
Langton Brook	Headwaters...Foxton Arm	RE4	SI LW
Foxton Arm	Headwaters...Langton Brook	RE4	LW
Langton Brook	Foxton Arm...R Welland	RE3	LW
Stonton Brook	Headwaters...Glooston Arm	RE5	LW
Glooston Arm	Headwaters...Stonton Brook	RE4	LW
Stonton Brook	Glooston Arm...R Welland	RE3	LW
Cranoe Brook	Headwaters...R Welland	RE4	LW
Medbourne Brook	Headwaters...Flood Storage Reservoir	RE4	LW
Medbourne Brook	Flood Storage Reservoir...R Welland	RE3	LW
Stoke Albany Brook	Stoke Albany Brook	RE4	SI LW
Middleton Brook	Middleton Brook	RE4	-

Watercourse	Stretch	Long-term (LT) RE target	Locally derived use-related WQOs
Great Easton Brook	Great Easton Brook	RE4	LW
Lyddington Brook	Lyddington Brook	RE4	LW
Seaton Brook	Seaton Brook	RE4	LW
Uppingham Brook	Uppingham Brook	RE4	LW
Fineshade Brook	Fineshade Brook	RE3	LW
Preston Brook	Headwaters...R Chater	RE4	LW
Lyndon Brook	Headwaters...R Chater	RE2	LW
Morcott Brook	Headwaters...Morcott	RE4	LW
Morcott Brook	Morcott...R Chater	RE2	LW
Easton Brook	Easton Brook	RE4	LW
Greatford Cut	Greatford Cut	RE3	SI
South Drain	Headwaters...Brook Drain	RE2	SI
Brook Drain	Headwaters...Ram Dyke	RE2	-
Ram Dyke	Headwaters...Brook Drain	RE2	SI
Brook Drain	Ram Dyke...South Drain	RE2	SI
South Drain	Brook Drain...R Welland	RE2	-
Folly River	Folly River	RE3	SI LW
New River	New River	RE3	SI LW
Counter Drain	Counter Drain	RE3	SI
North Drove Drain	North Drove Drain	RE3	SI
Vernatts Drain	Vernatts Drain	RE3	IWS SI

Watercourse	Stretch	Long-term (LT) RE target	Locally derived use-related WQOs
West Glen	Bitchfield...Burton Coggles Arm	RE1	LW
Burton Coggles Arm	Headwaters...West Glen	RE4	LW
R Tham	Castle Bytham...Little Bytham	RE2	SI LW
Pickworth Stream	Headwaters...West Glen	RE5	LW
East Glen	Headwaters...Lenton	RE4	LW
East Glen	Lenton...Toft	RE3	SI LW
Bourne Eau	Headwaters...R Glen	RE3	SI LW
Latham Lode Seasend	Headwaters...R Glen	RE3	SI
Blue Gowt Drain	Headwaters...R Glen	RE4	-
Risegate Eau	Risegate Eau	RE3	SI
Fosdyke Bridge Outfall	Fosdyke Bridge Outfall	RE5	-

APPENDIX 7

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).

Table 7.1: Dangerous Substances List

	LIST I	LIST II	RED LIST
METALS			
Mercury (Hg)	****		****
Cadmium (Cd)	****		****
Copper (Cu)		****	
Zinc (Zn)		****	
Lead (Pb)		****	
Tributyltin (TBT)			****
Triphenyltin (TPT)			****
Organotins		****	
Chromium (Cr)		****	
Nickel (Ni)		****	
Arsenic (As)		****	
Boron (B)		****	****
Vanadium (V)		****	
PCBs			****
PESTICIDES & ORGANOCHLORINES			
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 8

FRESHWATER FISH DIRECTIVE 78/659/EEC. MANDATORY STANDARDS

Parameter	Salmonid Imperative Standard	Cyprinid Imperative Standard	Notes
Dissolved Oxygen (mg/l O_2)	≥ 9	≥ 7	50% of samples must meet this standard.
	≥ 6	≥ 4	Absolute minimum
pH[1]	6-9[3]	6-9[3]	Derogations allowed in naturally acidic waters
Un-ionised ammonia (mg/l NH_3)	≤ 0.025	≤ 0.025	Calculated from temperature, total ammonia and pH
Total ammonium[2] (mg/l NH_4)	≤ 1	≤ 1	Relaxed standard of 3mg/l can be applied where there is good evidence of healthy fish populations
Total Zinc (mg/l Zn) Water Hardness (mg/l $CaCO_3$) ≤ 10 > 10 and ≤ 50 > 50 and ≤ 100 >100	 ≤ 0.03 ≤ 0.2 ≤ 0.3 ≤ 0.5	 ≤ 0.3 ≤ 0.7 ≤ 1.0 ≤ 2.0	Derogation allowed in areas of high mineralisation, natural enrichment or abandoned mines
Temperature at thermal discharges (°C)	≤ 1.5	≤ 3	Temperature change
	≤ 21.5[3]	≤ 28[3]	Maximum absolute limit
	≤ 10[3]	≤ 10[3]	Maximum during breeding periods if cold water needed for reproduction for certain species of fish
Total residual chlorine (mg/l HOCl)	≤ 0.005	≤ 0.005	A suitable test is not yet available for this parameter

[1] Artificial pH variations with respect to the unaffected values shall not exceed ±0.5 of a pH unit within the limits falling between 6.0 and 9.0 provided that these variations do not increase the harmfullness of other substances present in the water.

[2] In particular geographical or climatic conditions and particularly in cases of low water temperature and of reduced nitrification or where the competent authority can prove that there are no harmful consequences for the balanced development of fish population, Member states may fix values higher than 1 mg/l.

[3] Derogation possible in accordance with Article 11.

APPENDIX 9

MARGINAL FAILURES AGAINST RE TARGETS

River West Glen. (Burton Coggles Arm to Little Bytham).
North Brook. (Headwaters to Exton Arm).
Exton Arm. (Headwaters to North Brook).

Flows in these stretches virtually cease on an annual basis resulting in 'ponded' sections of water. Even during 'wet' summers the flows are considerably less than during the winter. It is no surprise that Bio-chemical Oxygen Demand (BOD) concentrations are slightly elevated as a result.

River East Glen. (Toft to the West Glen).

Again, flows in this section become extremely low during dry summers. Additionally, the old 'village sewer' at Braceborough discharges raw sewage into the river (**see Issue 9)** which aggravates the affects of low flow.

River Glen. (Kates Bridge to River Bourne Eau).

Flows in this section of the river are supplemented by the Gwash - Glen transfer scheme. However, the Gwash is fed directly from Rutland Water which itself suffers from eutrophication and algal activity (See **Issue 1b**).

A return to historical average rainfall in this catchment would very probably return the rivers to a state of compliance with long-term water quality objectives.

River Gwash (Headwaters to River Welland)

The headwaters, upstream of Rutland Water, are again subject to low summer flows, exacerbated by urban run-off from Oakham.

Downstream of Rutland Water the river is entirely fed by the 1 million gallon/day compensation flow released from the reservoir.

Rutland Water is recognised as suffering from eutrophication and algal action and hence causes the marginal Disolved Oxygen (DO) and BOD failure in the River Gwash.

It should be noted that the RE1 target is very high though and that a marginal failure against such a target is still a high achievement.

River Chater (Headwaters to River Welland).

The drought has significantly reduced flows in this river and hence its capacity to dilute the effluent from small village sewage treatment works.
Improvements are planned for RAF North Luffenham sewage treatment works.

River Welland. (Duddington to Tinwell P.S.).

Marginal failures in 1996 occurred when DO concentrations were low. Inspection of the flow data over the same period shows a reduction from $28m^3$/sec mean flow in 1995 to only $12m^3$/sec in 1996 (measured at Barrowden & Tixover).

The last failures due to DO prior to 1996 were recorded in 1991; again, mean flows were reduced to 11m^3/sec. It is a clear indication that low DO concentrations are flow related.

The question as to why upstream and downstream concentrations seem unaffected by reduced flows is a reflection of the physical nature of the watercourse itself. This stretch is highly weeded and shallow, very different to the deeper, less weeded sections up and downstream. Heavy weed growth can have a similar affect to an algal bloom by causing large diurnal variations in DO concentrations.

APPENDIX 10

OVERPERFORMING SEWAGE TREATMENT WORKS

In addition to Market Harborough, the following AWS Sewage Treatment Works (STWs) in the Plan area have been identified regionally as over-performing considerably against their Legal Consent conditions:

-Deepings
-Great Casterton
-Manthorpe
-Lyddington

Several other AWS STWs in the Plan area, too numerous to mention, are also over-performing to some extent.

APPENDIX 11

TIDAL WATER QUALITY

Table 11.1: Coastal & Estuarine Working Party Classification

DESCRIPTION	POINTS AWARDED IF THE ESTUARY MEETS THIS DESCRIPTION
Biological Quality (scores under a, b, c and d to be summed)	
a) Allows the passage to and from freshwater of all relevant species of migratory fish, when this is not prevented by physical barriers.	2
b) Supports a residential fish population which is broadly consistent with the physical and hydrographical conditions.	2
c) Supports a benthic community which is broadly consistent with the physical and hydrographical conditions.	2
d) Absence of substantially elevated levels in the biota of persistent toxic or tainting substances from whatever source.	4
Maximum number of points.	10
Aesthetic Quality	
a) Estuaries or zones of estuaries that either do not receive a significant polluting input or which receive inputs that do not cause significnt aesthetic pollution.	10
b) Estuaries or zones of estuaries which receive inputs which cause a certain amount of pollution but do not seriously interfere with estuary usage.	6
c) Estuaries or zones of estuaries which receive inputs which result in aesthetic pollution sufficiently serious to affect estuary usage.	3
d) Estuaries or zones of estuaries which receive inputs which cause widespread public nuisance.	0
Water Quality (Score according to quality)	
Dissolved Oxygen exceeds the following saturation values:	
60%	10
40%	6
30%	5
20%	4
10%	3
Below 10%	0

The points awarded under each of the headings of biological, aesthetic and water quality are summed.

Waters are classified on the following scales:

Class A Good Quality	24-30 points
Class B Fair Quality	16-23 points
Class C Poor Quality	9-15 points
Class D Bad Quality	0-8 points

APPENDIX 12

FISHERIES CLASSIFICATION SYSTEM

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

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

Biomass and density classification

Absolute

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

Figure 1

The class or grades are:

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

Relative

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

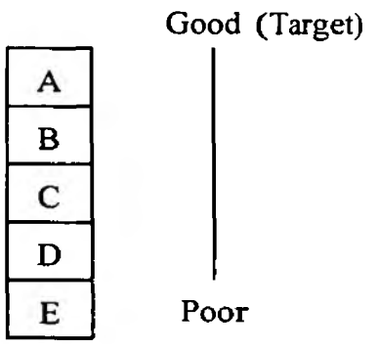
An example is shown below:-

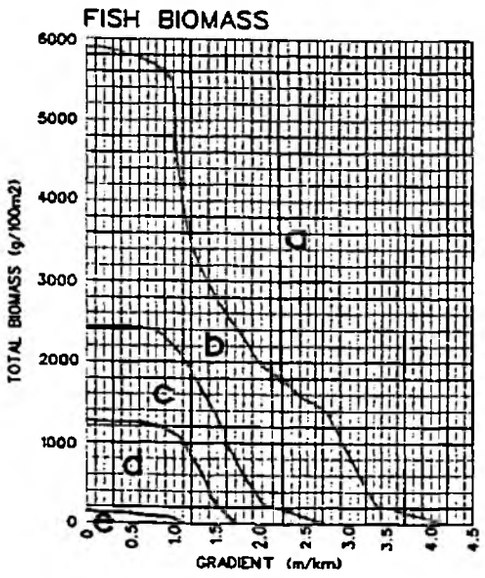
Data:	Width	4.2 metres
	Gradient	1.5m km
	Total biomass	2000 g/100m²

From Figure 1, this means CLASS B status is achieved.

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

The classes described by this scheme are:-





Species Richness

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

Figure 2

River width is classified into 1 of 4 zones:

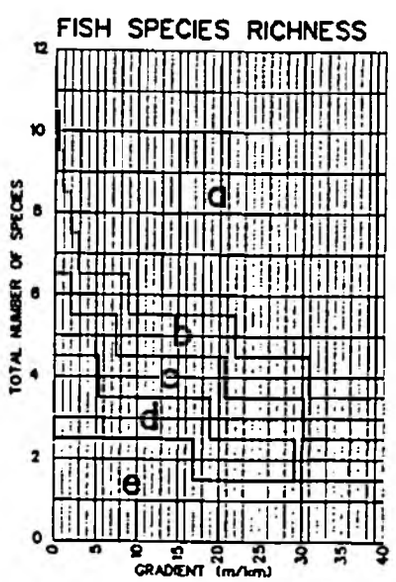
Zone 1	
	4m
Zone 2	
	6m
Zone 3	
	9m
Zone 4	

For example:

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

From Figure 2 the species richness classification is A.

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



APPENDIX 13

SCHEDULED MONUMENTS

Refer to Map No. 16

No.	Name
1	Braybrooke Bridge
2	Braybrooke Castle and deserted medieval village
3	Marston Trussell shrunken medieval village and moat
4	Old Grammar School
5	Old Hall moated site
6	Shrunken medieval village
7	Sibbertoft Motte and Bailey Castle
8	St Mary in Arden Church
9	Thorpe Lubenham Moated site and shifted medieval village remains
10	Foxton inclined plain
11	Pinslade moated grange, Mowsley
12	Gumley Motte Castle
13	Chapel in manor house grounds
14	Kibworth Harcourt Post Mill
15	Motte in Hall Field
16	Medieval village earthworks, Fishponds and mill leat
17	Bridge at Medbourne
18	Hallaton Motte and Bailey Castle
19	Rockingham Castle, shrunken medieval village, moat, warrens
20	Stoke Albany moated site and fishponds
21	Churchyard Cross
22	Defended enclosure on Robin-a-Tiptoe Hill
23	Moated site at Allexton
24	Moated site at Tilton
25	Mound near church
26	Deserted medieval village on A60003, Snelston
27	Bridge over River Chater
28	Bronze Age Enclosure
29	Castle mound
30	Earthwork in Morcott Spinney
31	Moated Site at North Luffenham
32	Sauvey Castle
33	Site of Abbey Church and Claustral buildings
34	Whatborough deserted medieval village
35	Wing Maze
36	Martinshorpe deserted medieval village
37	Area of medieval town near Barnhill House
38	Site of St. Peters Church
39	Site of town defences
40	Stamford Castle
41	Austin Friars Priory
42	Tower of city wall, West Street
43	Bowl Barrow near Hill Side Spinney
44	Brasenose Gate
45	Greyfriars Priory
46	Site of Brasenose College
47	Whitefriars Gate
48	Collyweston Sundial
49	Duddington Bridge
50	Ermine Street near Quarry Farm
51	Fineshade Motte and Bailey Castle and Abbey
52	Fishpond near church
53	Lyddington Bedehouse
54	Manor House and Gardens
55	Norman Arch at St Mary's Hill

56 Site of manor house and gardens
57 St Leonard's Priory (ruins)
58 St Michael's Priory rere-dorter
59 Wakerley Bridge
60 Wothorpe House
61 Air Photography site and Roman town site near village
62 Alstoe moot and part Alsthorpe deserted medieval village
63 Barnhill moated site, Hambleton
64 Butter Cross and Stocks
65 Oakham Motte and Bailey Castle and medieval gardens
66 Church Bridge
67 Dovecote
68 Dovecote and Arch, Formerly Lodge of Brooke House
69 Exton Old Hall
70 Horn deserted village and moated site
71 Manor House
72 Moated site with fishponds and enclosures, Empingham
73 Castle Dike
74 Bassingthorpe Manor moated site
75 Castle Bytham Castle
76 Causewayed Camp
77 Corby Glen Market Cross
78 Corby moated mound
79 Medieval gatehouse remains
80 Essendine Castle moated site
81 Norman manor house
82 Settlement site at Greatford
83 Settlement site at Greatford village
84 Shillingthorpe deserted village
85 Site discovered by aerial photography
86 Uffington Bridge
87 Woodhead Castle ringwork bailey and fishpond
88 Careby Wood Camp
89 The Round Hills Earthwork
90 The Hermitage moated site
91 Churchyard Cross, St Michaels Churchyard
92 Shrunken Medieval village
93 Site of Cistercian Grange
94 Swinstead Village Cross
95 Car Dyke section between Fen Bridge and White Port Road
96 Car Dyke section near church
97 Causewayed Camp
98 Gatehouse of Manor House
99 Lolham Bridges
100 Market Cross
101 Maxey Castle
102 Mound at Langdyke Bush
103 Ring ditches and other cropmarks near Lolham Hill
104 Roman Villa near Oxey Wood
105 Settlement site near Uffington and Barnack Station
106 Site of Torpel's Manor
107 Site near Lolham Hall
108 Village Cross and Lock-up, Deeping St James
109 Deeping Gate Bridge
110 Bourne Castle
111 Car Dyke Earthworks in Park Wood
112 Churchyard Cross, All Saints Church
113 Churchyard Cross, St Mary's Churchyard
114 Duck Decoy
115 Earthwork enclosure at Peakirk Moor
116 Elloe Stone
117 Kenulph's Stone
118 Pinchbeck Engine

119	Roman site, Priors Meadow
120	Settlement near Bank House
121	Settlement near Cate's Cove Corner
122	Settlement near the Parks
123	Settlement near the Parks
124	Settlement near Whitbread Farm
125	Shrunken medieval village
126	St Guthlac's Cross
127	Trinity Bridge
128	Village Cross, Towngate
129	Wykeham Chapel near Spalding
130	Ruins and site of Crowland Abbey

APPENDIX 14

SITES OF CONSERVATION IMPORTANCE

Refer to Map No. 17

No.	Site Name
1	Morkery Wood
2	HeyDour Warren
3	Barbers Hill Pit
4	Tallington Gravel Pits
5	Baston Common Sand and Gravel Pits
6	Holywell Wood
7	Holywell Big Quarry
8	Lincolnshire Gate Hedge
9	Pillowsyke Scrub
10	Easton Wood
11	Mickley Wood
12	Twyford Forest
13	Pasture Holt Wood
14	Sleights Wood
15	Elliots Wood
16	Great Osgrove Wood (Long Wood)
17	Colley Wood
18	Coley Holts
19	Ponton Park Wood
20	Boothby Great Wood
21	Welby Verge, Ermine Street
22	Abney Wood
23	Parsonage Wood
24	Ingoldsby Wood
25	Stamford Cemetery
26	Little Warren, Aunby
27	Docksight Wood, Holywell
28	Aunby Valley
29	Railway south of Bytham
30	Dane's Hill, Aunby
31	Careby Wood
32	Witham-On-The-Hill
33	Osgodby Coppice
34	Swinstead Valley/Grassland
35	Irnham Meadow
36	Far Old Park Wood
37	Old Park Wood, Irnham
38	South Wood, Irnham
39	Norwood
40	Scottlethorpe Quarry and Grassland
41	Park Wood
42	Tongue End Pit
43	River Welland (Spalding to Borough Fen)
44	The Spinney Brickyard Wood
45	River Welland (Spalding to Deeping St James)
46	Surfleet Seas End
47	Roman Bank, Surfleet Seas End
48	South Bank, Fossdyke
49	Adams Wood
50	Bainton Gravel Pit
51	Barnack Hills and Holes
52	Boundary Plantation
53	Boundary Plantation Grassland
54	Plantation Meadow
55	Bowd Lane Wood

56	Castor Hanglands
57	Collyweston Quarries
58	Collyweston Slate Mine
59	Coombe Hill Hollow
60	Dryleas Wood
61	Fineshade Railway Line
62	Great Coppice
63	Great Hollow
64	Gretton Plantations: Hedges
65	Hermitage Wood
66	Hermitage Wood Drive
67	Hill Top Spinney
68	Wakerley Spinney
69	Hollow Wood
70	Household Coppice and pond
71	Lodge Coppice and pond
72	Long Wood
73	New Coppice lane and reserve
74	The Dale
75	Peters Pond and Tinwell Crossing/Meadow
76	Racecourse Farm Fields
77	Rockingham Park
78	Spanhoe Wood
79	Spring Pond
80	St Mary's Wood
81	Stoke Albany Grassland
82	Top Lodge Verge
83	Town Wood
84	Wakerley Verge
85	Grand Union Canal
86	Great Bowden Borrow Pit
87	Woodland
88	Hedgerow
89	Pond
90	Oakham Canal
91	Hedgerow
92	Burley Bushes
93	Woodland
94	Barnsdale Avenue
95	Hedgerow
96	Woodland
97	Hedgerow
98	Woodland
99	Tunneley Wood
100	Roadside Verge
101	Woodland
102	Hedgerow
103	Lake
104	Hedgerow

APPENDIX 15

SITES OF SPECIAL SCIENTIFIC INTEREST

Refer to Map No. 18

No.	SSSI Name
1	Allexton Wood
2	Barnack Hills and Holes
3	Baston Fen
4	Bloody Oaks Quarry
5	Burley and Rushpit Woods
6	Castor Hanglands
7	Chater Valley
8	Clipsham Old Quarry and Pickworth Great Wood
9	Collyweston Quarries
10	Collyweston Slate Mine
11	Coombe-Hill Hollow
12	Cross Drain
13	Deeping Gravel Pits
14	Dogsthorpe Star Pit
15	Dole Wood
16	East Wood, Great Casterton
17	Empingham Marshy Meadow
18	Eye Brook Reservoir
19	Eye Brook Valley Woods
20	Eye Gravel Pit
21	Great Bowden Borrow Pit
22	Great Casterton Road Banks
23	Greetham Meadows
24	Grimsthorpe Park
25	Hermitage
26	Holywell Bank
27	Ketton Quarries
28	Kilby - Foxton Canal
29	Kirton Wood
30	Langtoft Gravel Pits
31	Launde Big Wood
32	Leighfield Forest
33	Luffenham Health Golf Course
34	Math and Elsea Woods
35	New England Valley
36	Newell Wood
37	North Luffenham Quarry
38	Porters Lodge Meadows
39	Priors Coppice
40	Racecourse Farm Fields
41	Ryhall Pasture and Little Warren Verges
42	Rutland Water
43	Seaton Meadows
44	Shacklewell Hollow
45	Southorpe Meadow
46	Southorpe Roughs
47	Stoke and Bowd Lane Woods
48	Surfleet Lows
49	Swinstead Valley
50	Tickencote Marsh
51	Tilton Cutting
52	Tolethorpe Road Verges
53	Tortoiseshell Wood
54	Wakerley Spinney
55	Wing Water Treatment Works
56	The Wash

APPENDIX 16

NATURE RESERVES

Refer to Map No. 19

No.	Name
1	Baston Fen
2	Boston Road Brickpit
3	Dole Wood
4	Surfleet Lows
5	Surfleet Reedbed
6	Tortoiseshell Wood and Meadow
7	Westhorpe Pit
8	Messingham Sand Quarry
9	Great Casterton Road Banks
10	Robert's Field
11	The Chasm
12	Thurlby Fen Slipe
13	Stantons Pit
14	Barnack Hills and Holes
15	Collyweston Quarries
16	East Carlton Countryside Park
17	Stoke Wood End Quater

GLOSSARY

Abstraction	The removal of water from any source, either permanently or temporarily.
Abstraction Licence	A statutory document issued by the Agency to permit removal of water from a source of supply. It can limit the quantity of water taken daily etc.
Agenda 21	A comprehensive programme of worldwide action to achieve a more sustainable pattern of development for the next century. UK Government adopted the declaration at the UN Conference on Environment and Development (the Earth Summit) held in Rio de Janeiro in 1992.
Algae	Microscopic (sometimes larger) plants, which may be floating or attached. Algae occur in still and flowing water.
Ammonia	A chemical compound found in water often as a result of pollution by sewage effluents. It is widely used to determine water quality. Ammonia detrimentally affects fish.
AMP2	An acronym for the second Asset Management Plan produced by the Water Companies for the Office of Water Services (OFWAT). It sets out the water industry investment programme for the period 1995 to 2005.
Aquifer	A water bearing-stratum situated below ground level. The water contained in aquifers is known as groundwater.
Anaerobic	Oxygen free.
Attenuation	Method by which additional surface water run-off caused by development is constrained to a run-off equivalent to its previous rate.
Augmentation	The addition of water by artificial input. (Usually to "top up" low flows in summer by either groundwater pumping or via reservoir release.)
Biochemical Oxygen Demand (BOD)	A standard test which measures over 5 days the amount of oxygen taken up by aerobic bacteria to oxidise organic (and some inorganic) matter.
Biomass	Total quantity or weight of organisms in a given area or volume - e.g. fish biomass is measured as grammes per square metre (gm^{-2}).
Biota	Biological life.
Buffer Zone	Strip of land 10-100m wide, alongside rivers which is removed from intensive agricultural use and managed to provide appropriate habitat types.
Bund	Low level walls built around oil tanks and other structures to contain accidental spillages of pollutants.
Coarse Fish	Freshwater fish other than salmon and trout.
Consent (Discharge)	A statutory document issued by the Agency. It can authorise entry and indicate any limits and conditions on the discharge of an effluent to a Controlled Water. A land drainage consent is an approval for specified structural works in areas under Agency control.
Controlled Waste	Industrial, household and commercial wastes - excludes mine and quarry waste, agricultural waste, sewage sludge, radio-active wastes and explosives.
Controlled Waters	All rivers, canals, lakes, groundwaters, estuaries and coastal waters to three nautical miles from the shore, including the bed and channel which may for the time being be dry.
Culvert	Drain or covered channel carrying water across or under a road, canal etc.

Derogate	Loss or impairment of a water resource, action causing such loss or impairment.
Ecology	The study of relationships between an organism and its environment.
Ecosystem	A functioning, interacting system composed of one or more living organisms and their effective environment, in biological, chemical and physical sense.
Effluent	Liquid waste from Industry, agriculture or sewage treatment plants.
Environmental Quality Standard (EQS)	The concentration of a substance which must not be exceeded if a specific use ofthe aquatic environment is to be maintained.
Eutrophic	A description of water which is rich in nutrients. At worst, such waters are sometimes beset with unsightly growths of algae.
Fauna	Animal life.
Fish Biomass	A measure of the quality of a fishery as found in terms of surveys, weight by area ie g/m^2.
Flood Plain	This includes all land adjacent to a watercourse over which water flows or would flow but for flood defences in times of flood.
Flora	Plant life.
Fluvial	Relating to the freshwater river.
Geomorphology	Scientific study of land forms and of the processes that formed them.
Gravity outfall	Discharge through a pipe or sluice with no pumping.
Groundwater	Water which saturates a porous soil or rock substratum (or aquifer). Water held in storage below ground level.
Hydrogeology	Branch of geology concerned with water within the Earth's crust.
Hydrology	The study of water on and below the earths surface.
Hydrometric	The measurement of water.
Impounded	The holding back of water behind a dam. Strictly a structure which raises water levels above their "normal" height. May need a licence and/or Land Drainage Consent from the Agency.
Inert	Chemically unreactive
Integrated Pollution Control	An approach to pollution control in the UK which recognises the need to look at the environment as a whole, so that solutions to particular pollution problems take account of potential effects upon all environmental media.
Internal Drainage Boards	Authorities responsible for dealing with land drainage within a district They are primarily concerned with agricultural land drainage but also may be involved with water supply to their district for agricultural purposes.
IPC Authorisation	An authorisation issued by the Agency prescribed by the Environmental Protection Act 1990 covering certain operation of processes .
Landfill	Site used for waste disposal into/onto land.
Leachate	Liquor formed by the act of leaching.

Macroinvertebrate	Animals without backbones eg leeches, snails worms, insects.
Main River	The watercourse shown on the statutory 'Main River maps' held by the Agency and MAFF. The Agency has permissive powers to carry out works of maintenance and improvement on these rivers.
Mitigation	Refers to the environmental impact of scheme development or operation and the actions which may be taken to reduce or ameliorate such impacts.
Morphology	The form of the structure of plants and animals.
Nitrate Vulnerable Zone (NVZ)	An area where nitrate concentrations in sources of public drinking water exceed, or are at risk of exceeding the limit of 50 mg/l laid down in the 1991 EC Nitrate Directive, and where compulsory, un-compensated agricultural measures will be introduced from 1996 as a means of reducing those levels.
Nutrient	Substance providing nourishment for plants and animals eg nitrogen, phosphorus.
Oil interceptor	Mechanism built into drainage channels to limit the contamination of surface water from oil - usually associated with garage forecourts, car parking areas and industrial sites.
Organic	Generally any substance containing carbon as part of its chemical make-up.
Over commitment	Over commitment is where the volume licensed for abstraction from an aquifer or river system, exceeds the availability of the water resource. In balancing supply and demand the Agency has to consider not only licensed abstraction eg spray irrigation, Public Water Supply and industrial use but also the environmental needs and riparian uses such as livestock watering.
Package Treatment Plant	Small sewage treatment plant built to treat effluents from small numbers of dwellings.
Permeability	The ease at which liquids (or gases) can pass through rocks or a layer of soil.
Permissive powers	Powers which confer on the Agency the right to do things but not the duty to do them.
pH	Quantitative expression of acidity or alkalinity of a solution.
Phenols	A class of aromatic compounds with one or more hydroxyl (-OH) groups directly attached to the benzene nucleus.
Public Water Supply	The supply of water by companies appointed as Water Undertakers by the Secretary of State for the Environment under the Water Industry Act 1991.
Putrescible waste	Organic waste which decomposes to form a toxic liquor.
RAMSAR	Wetland site of International Importance that is designated under the Ramsar* convention (*a town in Iran where the international convention originally agreed in 1975 to stem the progressive encroachment on, and loss of, wetland).
Raw Water Transfer	The transfer of water from one resource to another in order to meet or anticipate demand. It is usually part of a scheme such as a reservoir or pipeline.
Return Period	Refers to the frequency of a rainfall or flooding event. Flood events are described in terms of the frequency at which, on average, a certain severity of flow is exceeded. This frequency is usually expressed as a return period in years, eg. 1 in 50 years.
Riffle	A shallow area in a river where the substrate is composed of gravel and the flow is faster.
Riparian Owner	Owner of riverbank and/or land adjacent to a river. Normally owns river bed and rights to the midline of channel.

River Corridor	The continuous area of river, river banks and immediately adjacent land alongside a river and its tributaries.
Saline Ingress	Salt water may enter rivers through or around tidal structures - this is known as ingress. Once salt water has entered a watercourse it is difficult to remove other than by flushing with high flows during floods. It can have profound effects on the ecology of a river.
Saline Waters	Water containing salts.
Sewage	Liquid waste from cities, towns and villages which is normally collected and conveyed in sewers for treatment and/or discharge to the environment.
Sewerage	System of sewers usually used to transport sewage to a sewage treatment works.
Silage	A winter feed for cattle. Silage is produced throughout the summer by bacterial action on freshly cut grass or other crops stored in silos.
Sludge	The accumulation of solids from treatment processes. Sludge can be incinerated or spread on farm land.
Slurry	Animal waste in liquid form.
Spray Irrigation	The watering of crops by spraying. Can have a high impact on water resources.
Storm Sewer Overflow	Overflow built into combined surface and foul sewerage systems to accommodate higher volumes generated during intense rainfall events thereby protecting the integrity of the sewer and preventing properties from flooding. These discharge diluted but untreated effluent direct to watercourses.
Surface Water	Water collecting on and running off the surface of the ground.
Sustainable Development	Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.
Sustainable Management	The interpretation of the principles of sustainable development at a local/regional level within the boundaries of national and international political, economic and environmental decisions.
Taxa	Groups of similarly classified animals and plants.
Telemetry	A means of directly collecting data from remote sites.
Tide Lock Periods	Periods when freshwater cannot leave a river system as the outfall structure, usually pointing doors, are closed by the pressure of the high tide against it. This corresponds with high tide sea levels being higher than the river water level.
Trade Effluent	Effluent derived from a commercial process/premises.
Washlands	Extensive semi-natural area of flood plain adjacent to a river, where water is stored in time of flood. Structures can be added to control the amount of water stored in the washland and time its release to alleviate peak flood flows in areas downstream.
Waste Transfer Stations	Site where waste is stored prior to it's disposal/recycling.
Weir	A dam built across a river to raise upstream levels.
Wetland	An area of low lying land where the water table is at or near the surface for most of the time, leading to characteristic habitats.
Winter Storage Reservoir	Reservoirs built by farmers to store water during the winter months when it is "plentiful" for re-use during the summer.

Index

MANAGEMENT AND CONTACTS:

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.

Head Office is responsible for overall policy and relationships with national bodies including Government.

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Tel: 01222 770 088
Fax: 01222 798 555

For general enquiries please call your local Environment Agency office. If you are unsure who to contact, or which is your local office, please call our general enquiry line.

ENVIRONMENT AGENCY
GENERAL ENQUIRY LINE
0645 333 111

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

ENVIRONMENT AGENCY
EMERGENCY HOTLINE
0800 80 70 60

ENVIRONMENT AGENCY

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Regional Headquarters:
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Tel: 01733 371811
Fax: 01733 231840

All enquries to:
The Catchment Planning Officer
Environment Agency
Waterside House
Waterside North
Lincoln
LN2 5HA
Tel: 01522 513100
Fax: 01522 512927