

Lower Lee

CATCHMENT MANAGEMENT PLAN

Draft Consultation Report

January 1995

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NATIONAL RIVERS AUTHORITY MISSION STATEMENT

We will protect and improve the water environment by the effective management of water resources and by substantial reductions in pollution. We will aim to provide effective defence for people and property against flooding from rivers and the sea. In discharging our duties we will operate openly and balance the interests of all who benefit from and use rivers, groundwaters, estuaries and coastal waters. We will be businesslike, efficient and caring towards our employees.

LOWER LEE CATCHMENT MANAGEMENT PLAN CONSULTATION REPORT

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ACKNOWLEDGEMENTS

- (1) All those organisations, groups and individuals who responded to the NRA during the period of informal liaison. A detailed review of this process is given in Appendix II.
- (2) Ordnance Survey on whose maps some of the information shown on the synoptic maps is based. (Crown Copyright Reserved Licence No. WU29859X).
- (3) Whilst every effort has been made to ensure the accuracy of information in this report, it may contain errors or omissions which we will be pleased to correct.

The purpose of this section is to highlight the importance of integrated management of the water environment and to outline the key role of the National Rivers Authority. It describes the Catchment Management Planning process and the purpose of this Consultation Report.

1.1 Our Water Environment

The quality of our water environment and the way in which it is managed matters to all of us.

Our health depends on the availability and purity of water supplies and the way we dispose of waste water. Thames Region is highly populated and sees the greatest use and reuse of water of any part of the country. These pressures call for the strict control of water abstraction and effluent disposal.

Many householders and businesses rely on flood alleviation works and flood warning schemes to reduce the risk of flooding. Visitors as well as local communities benefit from the amenity and recreational opportunities offered by the Region's rivers, canals and lakes.

The water environment also supports a wide variety of habitats which are home to a range of plants and animals. Conservation and enhancement of these is fundamental to the well being of the Region's natural resources.

This document is the first step in a process called catchment management planning initiated by the National Rivers Authority (NRA), which provides a focus for those concerned with the future health of the Lower Lee catchment's water environment.

1.2 The NRA Role

Established in 1989, the NRA is the principal agency responsible for safeguarding and improving the water environment in England and Wales. Our role is defined in our Mission statement (shown on the inside of the front cover) and embraces statutory responsibilities for:

- water resources
- water quality and pollution control
- flood defences
- fisheries, recreation, conservation and navigation.

We have placed a particular emphasis on planning for environmental sustainability and improvement through an integrated approach to river catchment management. This approach recognises the need to influence and work in partnership with others.

We therefore recognise the need to work with local communities, landowners, interest groups, industry and other agencies whose activities and interests interact with or include the water environment. The roles and responsibilities of some of the key agencies are described in Appendix I, as are the NRA's responsibilities, aims and objectives.

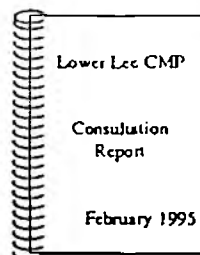
1.3 Catchment Management Plans

The water environment (e.g. estuaries, coastal waters, rivers, streams, lakes, ponds, underground water and springs etc.) is subject to a wide variety of uses which invariably interact and sometimes conflict with each other. Our catchment management planning process (shown on the diagram opposite) has been developed to help manage these interactions and conflicts for the overall benefit of the water environment and its users.

1 MANAGING THE WATER ENVIRONMENT

STEPS IN THE CMP PROCESS

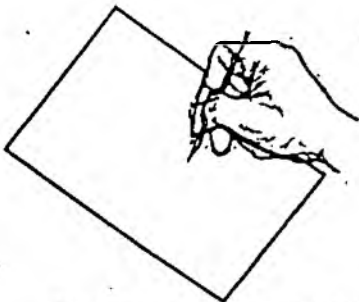
STEP 1



The NRA produce a Consultation Report. This will include:

- a full description of the catchment's resources, uses and activities
- a review of the status of the water environment
- identification of issues
- a draft vision, strategy and options to tackle the issues

STEP 2



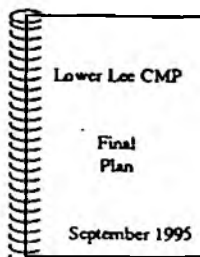
From February to April 1995 organisations, groups and individuals interested in the future of the catchment can make comments to the NRA.

STEP 3



During summer 1995 there will be discussions between the NRA and key groups and individuals over key issues.

STEP 4



The NRA will produce the Final Plan in September 1995.

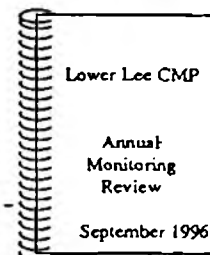
- This will include:
- a summary of the catchment's resources, uses and activities
 - an agreed vision, strategy and detailed action plans
 - a description of future monitoring regime for

NRA Thames Region action plans

STEP 7

After 5 years (or sooner if circumstances dictate) the NRA will fully review the CMP starting with consultation

STEP 6

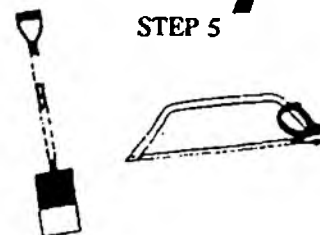


The NRA will produce a monitoring plan each year.

This will include :

- an update on the status of the water environment
- progress achieved on the Action Plans
- a review of the appropriateness of the Final Plan.

STEP 5



IMPLEMENTATION

The NRA will implement through its own actions and the persuasion of others the actions contained in the Final Plan.

1.3 Catchment Management Plans (continued)

The purposes of a Catchment Management Plan (CMP), which is a non-statutory document, are to:

- focus attention on the water environment of a specific river catchment
- involve all interested parties in planning for the future well being of that catchment
- agree a vision for the catchment which helps to guide all our activities over the next 10 to 20 years
- establish an integrated strategy and plan of action for managing and improving the catchment over the next five years.

Preparation of a CMP involves a number of activities which are described in detail in the diagram on page 5. This document, the Consultation Report, is the first output from the process and not the finished Plan.

1.4 The Context of this Plan

The River Lee is one of the major tributaries of the River Thames. Due to its size, the number of its tributaries, and the significant differences it has throughout its length, we have decided to split it into three sections for the purposes of producing CMPs. These sections each have their own CMP and are the:

- | | |
|-------------------|--|
| ● Upper Lee CMP: | Consultation Report (March 1993)
Final Plan (September 1994) |
| ● Middle Lee CMP: | Consultation Report (September 1994)
Final Plan (due April 1995) |
| ● Lower Lee CMP: | Consultation Report (March 1995)
Final Plan (due September 1995). |

Whilst each of the three sections is distinct and has definitive boundaries, it must be recognised that they interact. The most obvious example is that the water leaving the Upper Lee catchment area flows into the Middle Lee catchment area and the water from all the rivers in the Upper and Middle Lee catchments flows through into the Lower Lee catchment.

Actions and influences that arise from the Upper and Middle Lee CMPs will be taken into account in the Final Plan for the Lower Lee. It must also be remembered that the River Lee itself discharges into the River Thames. The relevant CMP, Thames Tideway, is due to be published as a Consultation Report in September 1995 and as a Final Plan in June 1996. The conclusions of the Lower Lee CMP will be taken into account when the South-East Area of Thames Region prepare this Plan.

CONTENT OF CONSULTATION REPORT

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we discuss the importance of the water environment, how it is managed, the role of the NRA, the process of catchment management planning, the structure of the Consultation Report and the timetable for producing the Final Plan.

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we present a strategy and set of potential actions to address the key issues and concerns facing the catchment's water environment. Those likely to be involved in implementing actions plans are also identified

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we describe the catchment, its natural resources, the uses made of the water environment and the activities likely to affect it.

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we review the condition of the water environment in relation to the characteristics of water quality, water resources (or quantity) and physical features. Areas of concern and key issues for the water environment are identified.

1.5 The Consultation Report

A summary of the contents of this Consultation Report is shown on the previous page.

This report does not seek to establish in a final form the vision and guiding policy objectives for the catchment, or define in detail the action plans to tackle the key issues for the water environment. Rather it describes the catchment, reviews the state of the water environment and identifies an outline strategy, including a draft vision, for tackling the key issues facing the Lower Lee Catchment.

The draft catchment vision, supporting policy objectives and potential actions, we present in Section 2 will only be finalised once we have had an opportunity to review and consider your response to this Consultation Report.

We have produced this document through internal discussion, informal liaison with a wide range of organisations (see Appendix II for details) and a desk study of reports produced by organisations such as local authorities.

1.6 The Consultation Process

The NRA has a pivotal role to play in the management of the water environment, and recognises the importance of liaison with all interested parties. Through this Consultation Report we want to obtain a consensus. We are particularly interested to hear your views on the following aspects of the Consultation Report:

- the descriptions of resources, uses and activities in the catchment
- the assessments of issues arising within the catchment
- the way forward for dealing with the key issues
- the draft catchment vision and strategy.

Our consultation phase includes:

- a formal launch to an invited audience on XXX
- open public meetings on XXX
- distribution of this report and a summary leaflet to key organisations, groups and individuals
- placing of information in libraries and other public areas
- publicity through contact with the local media.

1.6 The Consultation Process (continued)

At the end of the consultation period we will consider all comments and produce a Final Plan. This will define a strategy for the future management of the catchment and a series of action plans for the NRA and others to implement.

If you wish to comment please do so by XXX. The Final Plan for the Lower Lee Catchment is due for publication in September 1995.

Please submit comments to:

Kevin Reid
National Rivers Authority Thames Region
The Grange
97 Crossbrook Street
Waltham Cross
Herts, EN8 8HE.

For further information please contact Kevin Reid (Catchment Management Officer) or Craig Woolhouse (Catchment Manager) on 0992-645045.

In the following section we describe issues that have arisen through investigation of the catchment and through informal liaison. We suggest ways of dealing with these issues and look for your comment on the best way forward. We also identify where partnership is necessary to achieve action.

This section is about the future of the Lower Lee catchment. It describes the key issues facing the catchment and includes a one page statement called a Vision (see Section 2.2). The purpose of the vision statement is to establish what we want to achieve in the Lower Lee catchment and how we want to achieve it. To be successful it must have the support of local people, interest groups, industry and statutory groups. The vision statement does not describe individual actions, but indicates the type of water environment we want to achieve in the next 20 years. The detail of what we need to do is included in the fifteen issue summaries (Sections 2.3 to 2.17) and in the inventory of potential action sites (Section 2.18). Section 2.19 describes how the themes expressed in the vision statement are related to the issues.

However, we realise that there is a large amount of additional knowledge and ideas within the catchment and **this is why we want to hear the views of any person, group or organisation interested in the future of this area.**

Firstly, we want to hear if we have got things wrong:

- if there are other issues, not yet covered
- are there other options we have not considered
- are there more pros and cons
- is our data, maps and interpretation of information accurate.

Secondly, and just as importantly, we want to hear if we have got things right:

- do you agree with our catchment vision
- do you support the way forward with issues
- is our information useful
- is the NRA welcomed in trying to pull together the actions of various organisations.

Everything in this section is in a draft form. The vision, the interpretation of issues, the proposed actions and potential partnerships are all open to change in response to your views.

A report on the consultation process will be included in the Final Plan when it is published in Autumn 1995. We will try and accommodate any comments we receive. However, we must all realise the constraints on action which come about because of varying powers of organisations, land ownership and availability, timescales and inevitably, money. Even if no action is possible in the short term, any ideas raised can be considered for longer term investigation or implementation when circumstances and priorities may be different.

The Lower Lee Catchment is an area which is dominated by the conurbation of Greater London. The population of over 1 million people means that this is one of the most densely populated catchments not only within the UK but also within Europe. People use water for their most basic needs such as drinking, cooking, washing and sanitation. We also depend on water for recreational purposes, and the added interest it contributes to the landscape. On top of this the water environment plays a vital role in nature conservation, providing habitats for plants, insects and animals. Additionally we need to protect people and property against flooding. With such a large population, these needs bring about heavy demands on the water environment.

In meeting these many and varied demands our predecessors have left us with a difficult legacy in the Lee Valley. This legacy includes many concreted lined river channels, the loss of natural habitats and unacceptable water quality problems. This poor environment is coupled with the social and economic aspects of urban decline in parts of inner London.

However, the Lee Valley has proved to be very resilient. The River Lee is at the heart of the green corridor which links the River Thames, through east and north London to the Metropolitan Green Belt in Hertfordshire and Essex. This corridor is now the focus for a range of significant environmental, economic and social regeneration initiatives supported by European, National, Regional, Local and community interests. Future generations may therefore inherit a much improved environment even though our demands for water supplies, recreational activity, flood defences and conservation remain just as significant.

The purpose of this vision statement is to provide the context for action to sustain and improve the health of the catchment's natural water environment and ensure that appropriate uses of the water environment are managed in a sustainable manner. As no single individual or body is in a position to ensure this vision is fulfilled, it is essential that a partnership is built up consisting of the NRA, other relevant organisations and groups, local councils, local businesses and, critically, local people.

Together we ALL make up the local community and can ALL work towards the following themes:

Communications and Co-ordination

- we need to ensure that diverse actions are sustainable by co-ordinating activities designed to deal with environmental, economic and social issues
- we need to ensure that the range of groups, agencies and individuals, active within the catchment, communicate effectively

Raising Our Sights

- we need to recognize that breaking the cycle of social, environmental and economic decline is a key element in gaining sustainable environmental improvements
- we need to raise the expectations of what can be achieved in the catchment
- we need to raise awareness of the value of the water environment to local people

Catchment Quality

- we need to protect and enhance the backbone of the catchment, the Lee Valley corridor, recognizing that the health of the River Lee is dependent upon that of all the water courses and groundwater contributing to it
- we need to ensure the health and safety of people, property and the natural environment
- we need to balance the interests of the many direct and indirect users of the water environment whilst recognizing the legitimate but very heavy and concentrated demands we place on the catchment

Background

The Lower Lee is an immensely complex catchment in terms of both its physical features (i.e. river channels, tidal influences, flood protection works, water supply and overall infrastructure) and management (see Section 3.2 which describes the numerous agencies involved).

There are several statutory groups whose actions and policies do play a major role in shaping the water environment. These are the NRA, Lee Valley Regional Park Authority (LVRPA), Thames Water Utilities Limited (TWUL), British Waterways (BW), English Nature (EN) and the local authorities within the catchment. As well as these are the other bodies and interest groups like Lower Lee Project (LLP), Royal Society for the Protection of Birds (RSPB) and Friends of the Earth (FoE).

It is important that the statutory groups work well together. The sharing of data and views is an essential first step in achieving good action and the best use of resources. This is particularly true in this catchment because of the complex inter-actions and needs of users of the water environment. However, it is also important that the statutory bodies can demonstrate support for their initiatives amongst the local population and interest groups. Community participation in policy making and the implementation of actions has been successfully promoted in a number of limited areas, but there are opportunities for much greater involvement.

We also believe there will be benefit in interested parties development a shared strategy for the Lee Valley in particular. This would ensure that when individual opportunities for change arise action can be assessed against agreed policy objectives. Thus, rather than undertaking a range of unrelated actions which may conflict, individual action can be seen to be contributing incrementally to a shared objective.

The process of producing this CMP, and in particular the next stage, the development of the Action Plan, will assist in co-ordinating actions and improving communications. However, it is essential that this process is continued in order to (i) ensure proper implementation of the actions and (ii) to enable a rolling programme of future actions and to allow all the active groups in the catchment to respond to new and changing circumstances.

For these reasons, we believe that action should be taken to improve communications. Please let us know what you think about the following options or if you have any other suggestions:

Options

- (1) An annual or 6 monthly Public Catchment Meeting.

This could be led by the main agencies involved, but open for any other group or individual to attend and give an opportunity for issues and problems to be raised.

Options (Continued)

- (2) Option (1) could be split into two or three sub catchments (e.g. Lee Valley downstream of Tottenham) to give a more localised focus.
- (3) Establish a small working party from interested agencies and groups to drive forward integrated action plans and establish a shared strategy for the Lee Valley.
- (4) Publish a quarterly/6 monthly news sheet with distribution to all interested groups and an open invitation for contributions and comments.
- (5) Utilise existing communication channels and take opportunities for multi-agency co-operation where possible.

Pros and Cons

All options will need commitment from people who are usually already overstretched.

Option (1) could be in danger of being a cumbersome event with too many people to make progress.

Option (2) could result in duplication of effort from catchment wide interest groups, e.g. BW, WUL, LVRPA.

Option (3) may exclude some of the smaller groups who have a role to play.

Option (4) publications need to be carefully prepared and promoted to be successful.

Option (5) may lack a new impetus and miss opportunities for wider contacts but does have the benefit of minimising time spent talking rather than doing.

Background

The Lower Lee valley has a long history of industrial development. Industries were often located in "vacant" areas along the riverside, which were previously undeveloped because of flooding concerns. Directly underlying these areas are the terrace gravels, deposited by the River Lee, which form a minor aquifer. For almost the entire catchment the major Chalk aquifer lies much deeper, protected by the Reading Beds and the London Clay.

For many industries little control was exercised in handling potentially polluting substances, at least until recent decades. In many areas, large tracts of ground have become contaminated. Groundwater too has been subject to polluting inputs over a long period of time and it is evident that there is widespread contamination of the gravel aquifer. Groundwater in the Chalk aquifer, however, is generally of good quality and it is used extensively for public supply. There are a few, apparently isolated, cases where groundwater in the Chalk aquifer has been degraded by polluting inputs. This may have been caused by leakage of contaminants via poorly lined boreholes or in some instances, by deliberate discharge of substances.

The types of activity which may have led to contamination in the Lee valley included:

- uncontrolled tipping of waste into former gravel pits
- manufacture of town gas
- chemicals manufacture
- use of unlined sewage lagoons
- armaments manufacture
- various engineering works.

The extent and degree of contamination has not been defined fully. Our knowledge is often site specific, having been derived principally from sites which have undergone redevelopment or, in some cases, where environmental audits have been carried out. This process has revealed groundwater contamination in the gravels to be severe in some localities, particularly in the southern most reaches of the River Lee in London.

Some problems of contamination have been addressed with varying degrees of success, particularly where this has been necessary during redevelopment of sites. Examples include works carried out at former gas works sites; a former armaments manufacturing site and certain chemicals industry sites. Contamination, including that in groundwater, at former petrol stations has been addressed in some cases with a high degree of success. However, some groundwater contamination is likely to remain intractable.

When dealing with contaminated ground and groundwater the policies described in the NRA's "Policy and Practice for the Protection of Groundwater" in respect of contaminated land will be applied. For the Lower Lee catchment this will require the protection of "sensitive receptors", including:

- water abstractions from wells and boreholes, particularly where it is used for public supply
- watercourses which may be subject to ingress of polluted groundwater
- where polluted groundwater in the perched gravel aquifer could enter the Chalk aquifer (e.g. where the Chalk lies directly below the gravels near Hoddesdon) through poorly lined boreholes or poorly installed piles.

Background (continued)

This will be achieved by:

- removal of the source of continuing or potential pollution. In many cases the polluting activity has ceased so that the primary pollution source has in fact been removed
- removal of any secondary source of pollution, such as contaminated ground which may lead to further pollution of water
- consideration of the merits of groundwater clean-up on the basis of protection of sensitive receptors. In some cases it is acknowledged that groundwater clean-up options and benefits may be very limited.

The most likely sensitive receptors in the catchment are watercourses although adverse impacts from ingress of polluted groundwater are not apparent. Many watercourses derive a significant proportion of flow from urban run-off which frequently carries a contaminant loading. This, combined with dilution in the watercourse, would tend to mask any impact on water quality due to the ingress of contaminated groundwater.

Options

Unilateral action by the NRA to clean up groundwater is not considered appropriate at present and would not provide the best value for money in addressing groundwater protection.

The means for achieving future protection or clean-up of groundwater quality are to a large extent likely to be opportunistic and will include:

- the NRA and the Planning Authority working together to ensure appropriate environmental remediation and protection measures are included as part of any planning permission on potentially contaminated sites
- pollution prevention initiatives by industry, including clean-up of groundwater, where appropriate, will be encouraged and supported by the NRA. In some cases, pollution prevention visits will be undertaken by NRA staff
- prosecution procedures to be followed by the NRA where active pollution is found to occur
- the NRA will investigate the feasibility of compiling its own list of locations where groundwater contamination is known to exist or may potentially occur. This would improve the effectiveness of the opportunistic approach
- the NRA will seek to ensure that new developments which have the potential to cause contamination, are located, designed and operated in a manner which minimises the risk of contamination occurring. This will be done through using the Town & Country Planning system and the NRA's own powers, where these are available.

Pros and Cons

A combination of all the options is likely to be needed to ensure that no further deterioration in groundwater quality occurs within the catchment.

Background

Water quality in the River Lee, Lee Navigation and semi tidal channels south of Tottenham Locks are of a poor to fair standard (see Section 4.1). This is sufficient to support fair to good quality fish populations (see Section 3.7). However, there have been a number of occasions over recent years when large fish kills (up to several thousand) have occurred in this section of the river. The reasons for this have not been specifically identified.

This situation is actually a substantial improvement over the status of the river 20 or 30 years ago when water quality was constantly too poor to support a healthy fish population. Under such circumstances, drops in water quality would have been less obvious.

The main water flowing into this area comes from two major sources. Firstly, urban tributaries such as the Pymmes Brook, Salmons Brook, Moselle Brook, Stonebridge Brook and Ching Brook, which all receive rainwater from urban areas. Secondly, Deephams sewage treatment works (STW) effluent which can comprise over 75% of the flow in the River Lee in this area.

The large fish kill events tend to occur after medium sized summer storms (5-10mm of rain) following dry periods of a week or more. The chemical action of pollutants in the water leads to the rapid depletion of oxygen, thus killing off fish and other small fauna in the river.

During the summer of 1994, the NRA commissioned a study into the water quality problems in this area. The study involved setting up water quality monitoring equipment in the Pymmes Brook and Salmons Brook tributaries and in Deephams STW effluent channel. The information gained from these and existing NRA data from routine quality samples, volumes of flow, known discharges to rivers and rainfall patterns, allowed a computer water quality model to be developed and calibrated. With the model set up, it was then possible to simulate a wide range of conditions which could give rise to the sharp drop in water quality.

More water quality monitoring stations are, however, needed as there was insufficient data from the individual tributaries to narrow down the many specific points of potential pollution. However, the study was able to suggest the most likely causes, which include:

- **Urban Run-off**

After a sustained dry period, the amount of litter, leaves, animal faeces, oil and grit from roads accumulates in the gullies of road drains. Light rainfall will leave this matter undisturbed whilst heavy rainfall will flush pollutants through the surface water drains and into rivers. However, due to the large volume of water the pollution will be greatly diluted. Problems arise when a medium sized storm may just flush the polluting matter out without much dilution. As the catchment area, Haringey, Enfield and Barnet is predominantly urban and the time taken for rain falling to get into the river is short, this problem can be very severe.

Background (continued)

- **Stonebridge Brook/Moselle Brook Catchment**

As these two rivers are almost completely culverted it is difficult to see or detect any pollution. However, the investigations indicated that additional pollution comes from this area, and there have been instances of observed pollutants in Stonebridge Brook as it joins the River Lee.

- **Sediment in the River Lee**

Sediment (around 1-1.5 m deep in places) on the bed of the River Lee, could be mobilised by high, fast flows entering from tributaries. It is possible that the chemical constituents of the sediment could produce the type of pollution that is experienced. The normally slow flowing River Lee would allow the deposition of silt and suspended solid particles in the water. These could come from urban run-off, the tributaries and from Deephams STW.

- **Combined Sewer Flows**

Some parts of the catchment have sewers which carry both surface water and foul water to STW. However, during storm conditions the sewer capacity can be exceeded by the increase in surface water flows and this can lead to the discharge of diluted foul water into rivers at storm overflow points. This is not currently felt to have a large impact on the pollution problems of this area because it only occurs when there are large volumes of rain water which dilute such pollution.

The problems are possibly, or even probably, a combination of the above factors, but clearly further investigation is needed to identify the more critical causes. Once this has been discovered, options for remediating the problem can be considered. It must be realised that any solution could be extremely expensive and complex.

Options

The NRA is committed to further research into this issue and is:

- installing 5 more Water Quality Monitors during Spring 1995
- undertaking more detailed analysis of sediment in the River Lee
- updating the water quality model with new data
- investigating in greater detail some of the less well understood sources of pollution.

In addition to this, the NRA and others could provide improved habitat and refuges for fish in the short to medium term to reduce the impact of pollution on flora and fauna until the root cause of the problems can be addressed.

Options (Continued)

The types of action could include:

- creation of fish refuges. These are areas where fish could escape from mass pollution. Typical locations would be at the mouth of tributary rivers, or backwaters, or eddies where the main flow of polluted water would by-pass the refuge leaving it relatively clean. Possible locations for fish refuges include:
 1. The basin at the confluence of the West Cut and River Lee Navigation, just below Tottenham Locks, Ferry Lane, Tottenham. Work would involve deepening the basin and developing emergent vegetation as a fish refuge.
 2. Confluence of the East Cut and River Lee Navigation, 400 metres south of Ferry Lane. Creation of a fish refuge by deepening the basin, removing concrete banks and developing natural bank side and aquatic vegetation.
 3. Lee Valley Ice Rink, north of Lea Bridge Road, Clapton. There is an opportunity for creating an off-line fish refuge.
 4. Hackney Marshes, confluence of Flood Relief Channel (culverted) with River Lea. Remove part of the culvert to create fish refuge.
 5. Leyton Common sewer confluence with River Lee. Improvement of habitat and installation of flow deflectors to develop this area which already acts as a fish refuge.
- install aeration equipment at fish refuges. This could blow oxygen into the water to further improve the conditions for fish
- create small weirs (not on navigable channels) to induce re-aeration of the water
- install groynes to break up flow and encourage riffle/pool development
- use bales of barley straw to control algal growth. The chemicals released during decomposition of the bales in water restricts algal growth.

Pros and Cons

Tackling the root causes of the pollution is going to be a long and costly project. Actions in the short to medium term would help to improve river conditions even after the root causes of pollution have been rectified as there would still be the chance that accidental contamination could occur.

Background

The issue of water levels is of concern in a number of locations within the catchment. Firstly, some areas of valuable habitat are dependent upon maintaining certain water levels, these include sites designated as SSSI's (see Section 3.6), for which the NRA has agreed to produce Water Level Management Plans in conjunction with English Nature (EN).

Secondly, areas of known or potential archaeological value which have not been excavated will need to be kept waterlogged in order to preserve any remains that exist. This is particularly true of locations along the Lee Valley where remains are thought most likely and are contained within peat deposits which readily dry out (see Section 3.8).

Thirdly, water levels and flow rates need to be maintained within rivers to maintain suitable habitats for fish populations and other flora and fauna. Low water levels will restrict the amount of food and habitat available, and slow or stagnant flow will lead to high weed growth which can have an adverse impact on fish habitats and make angling impossible.

Fourthly, boats using rivers and canals for navigation need enough water not to become grounded (sediment build up could also be a causing factor), and enough water to allow the operation of locks. Additionally, a through flow of water is helpful in preventing the rapid build up of surface weeds, especially at structures, which can choke engine intakes (see Section 3.9).

These requirements for particular water levels are set against a situation where water is abstracted from the River Lee in order to meet demands of householders and industry within the catchment. Furthermore, no one wants too much water. Flooding, when it occurs, is costly, unpleasant, very inconvenient and potentially dangerous. Fortunately, because of the flood alleviation works that have been completed within this catchment, flooding only occurs in a few locations and is relatively infrequent. These flood alleviation schemes have, however, disrupted the natural cycle of water management. Flood water is now rapidly removed from the catchment into the River Thames and out to sea. This is instead of being stored on flood plains (many of which have been developed) and in aquifers from where it would be slowly released back into the river system, thus helping to maintain base flows.

Option

A comprehensive review of the amount, distribution and uses of water as it passes through the catchment is essential to determine where, if at all, capacity exists to accommodate any of the additional demands that may be placed on the surface water. This could include examining the storage, diversion or use of flood waters during times of peak flows. It is possible that by extending this review in the upstream catchments of the Middle and Upper Lee, a more strategic approach could be taken. Such a study would particularly involve the NRA, British Waterways and Thames Water Utilities Limited.

Pros and Cons

Because the river system is so complex, developing a full understanding of how it works in detail will be a time consuming, expensive process with the need for measurements to calibrate any computer model developed. Without this work, however, changes in flow distribution to meet the needs of conservation, navigation, recreation, archaeology and others, will continue to be carried out in a piecemeal fashion.

Four areas of specific action are now described:

(i) Walthamstow Marshes Site of Special Scientific Interest (SSSI).

Background

This is an area of 90 acres of primary meadow and marshland which has never been ploughed and still bears the imprint of Ice Age braided river channels on its surface. As such, it is unique in the catchment and rare regionally. The Walthamstow Marsh Society (WMS) aims to safeguard the Marsh and promote it as an educational resource. The area also falls within the Lee Valley Regional Park.

The NRA and English Nature are committed to adopting a Water Level Management Plan for this site during 1996/7. However, similar such work has already been done by the WMS as far back as 1981 and the LVRPA have formally adopted the 'Walthamstow Marsh Nature Reserve Development and Management Plan'. This includes proposals to construct a perimeter ditch which is already nearly complete and to abstract water from the Coppermill Stream to maintain water levels.

Options

NRA, EN, LVRPA and WMS to agree the WLMP for the Marshes, taking into account the work already done on this subject. The possibilities of abstracting water from the River Lee or Coppermill Stream to maintain levels and/or taking excess water during times of high flows along with any other ideas that come forward as a result of this consultation document should also be examined.

Pros and Cons

This subject has already been researched and so completion of an agreed WLMP may not be too difficult.

(ii) Waltham Abbey, Cornmill Stream, Old River Lee, RARDE Site

Background

This area to the north of Waltham Abbey encompasses two distinct SSSI's. One site is the RARDE site which is valued for its alder carr. This site also has a network of small natural and made channels running through it and its habitat is dependent upon the ground being kept damp. The other SSSI is the Cornmill Stream, Old River Lee and the flood meadow in between. The site is particularly noted for its dragonflies, but has also been used as a popular local fishing site.

The two main concerns are that the alder carr is drying out and that the flow in the Old River Lee and Cornmill Stream is very low, thus reducing the value as a fishery and promoting extensive surface weed growth which acts as a negative impact on the amenity value of the area. The latter problem has been known for several years and meetings have taken place to try and resolve the matter, but to no avail. Recent discussions regarding this site have involved the NRA, LVRPA, local angling clubs and the Hertfordshire and Middlesex Wildlife Trust. This has led to agreement over a number of short term measures such as a selective vegetation cut within the river channels, removal of duckweed, the adjustment of weir levels at Waltham Abbey and the identification of the key dragonfly areas.

These measures are ostensibly dealing with the symptoms rather than the cause. The NRA and EN are already committed to producing a WLMP for these two sites, but because of the high profile of the issues and the interdependence of the two sites, the NRA is currently attempting to bring forward preparation of a combined WLMP for the area as a whole.

Options

To be integrated in the WLMP, the following are potential actions:

- examination of the demands on water in this location, not forgetting the need to protect Waltham Abbey from flooding
- monitoring of the amount of water which currently passes through the various channels
- examination of options for changing the operation of the Dave Stoker sluice gates on Horsemill stream to divert more water through the RARDE site and along the Old River Lee and Cornmill Stream. This could include allowing an occasional 'flush' through flow of water at times of high flow rather than a constantly increased flow
- surveying of the Old River Lee and Cornmill Stream river beds to determine the need, if any, for selective dredging to improve flows
- any other ideas that come forward as a result of this consultation.

Pros and Cons

By examining the whole area, sustainable improvements can be sought which reach the best use of the available water to meet the needs of ecology, landscape, amenity and angling. Inevitably, with taking a wider view there is a longer lead time in gathering information and exploring options for change. During this process, it is essential that all interest parties are involved in the decision making.

iii) River Lee Navigation

Background

There have not been cases of difficulty with boat movements on the Lee Navigation as yet except in extreme circumstances. However, a lack of sweetening flow means that during summer months large growths of floating weeds, such as duckweed, occur especially upstream of locks. This can cause floating debris and litter to accumulate which can choke engine intakes. Furthermore the debris looks unsightly and severely limits angling opportunities. The problem is exacerbated by the high levels of nutrients in the water.

The future demands for navigation are likely to see an increase in recreational boating on the River Lee and the re-introduction of freight traffic. This means an increase in boat movements with the consequent increase in lock operations meaning that the longer term availability of water for navigation will need to be monitored.

Options

- investigate the available water resource in the Lower Lee for future scenarios of boat use
- investigate the availability of current water resources to provide greater flow down the Navigation channel
- purchase equipment to skim the duckweed from the surface. This would need cost justification and may need to be made available for weed on rivers in other catchments. It may need to be a collective purchase between interested parties

Pros and Cons

A long term view needs to be taken if substantial increases in use of the Navigation are to be realised without detriment to the rest of the water environment. Using machinery to tackle weed growth problems will mean a continual cycle of maintenance. It may be possible to make use of collected vegetation as compost.

(iv) Archaeological Sites

Background

River valleys and the Lee Valley in particular, are recognised as valuable areas for archaeology because their proximity to fresh water was vital for everyday living for past generations and river floodplains were fertile areas. Furthermore, these same wetland areas are good at preserving exhibits. This latter point is now of concern as it is felt that some of the important areas are drying out, thus risking the rapid deterioration of any remains as yet undiscovered (see Section 3.8).

Options

- Identify which sites of value are drying out
- Examine how these sites could be kept wet, in particular do they coincide with the areas● identified as requiring WLMPs in (i) and (ii) above
- Any other ideas that come forward as a result of this consultation
- Do nothing

Pros and Cons

The nature of archaeology is such that the value is always 'potential' because we will not know until excavations are carried out. This makes it difficult to assess costs versus benefits. Failure to act could result in the loss of valuable evidence about our history.

Background

Within the catchment there are a wide variety of amenity and recreational facilities ranging from water based activities to walks such as the Lee Valley Trail.

The Lee Valley Regional Park Authority (LVRPA) co-ordinates recreational activities within most of the Lee Valley for the benefit of the catchment population and beyond. LVRPA aims to further increase access to and within the park which will place greater pressure on existing facilities. The Eastern Council for Sport and Recreation (ECSR) believes that many of the currently available facilities for formal water based recreation have reached full capacity in terms of both levels of use and membership.

The River Lee has been used for a long time for navigation purposes and a common law public right of navigation exists on it. British Waterways, who are responsible for the Navigation, are also promoting the area for recreational purposes such as walking, cycling and wildlife and heritage issues. Policies for increasing the number of moorings are also included.

With over 2 million boaters, anglers, walkers and cyclists using the canals and rivers every year, the Lee Valley Regional Park is serving the needs of a much larger catchment population than is actually possible. As a result of this an increase in the number and type of recreational facilities currently available needs to be considered.

There is a need for further water based facilities and using old mineral extraction sites could be an option. The number of mooring sites available will also influence the accessibility of navigational stretches within the catchment. Informal recreation often depends for its success, on the quality of access into and across the park. This is often a limiting factor for opening up new walks.

Options

These activities could be implemented as individual issues or in a phased manner whereby the most overused facilities are dealt with first.

Footpaths and Towpaths

Increased accessibility within the park could open up more footpaths and towpaths for informal recreational pursuits. Current examples include the work being proposed by the Lower Lea Project in the southern part of the catchment for footpaths on the Waterworks River, cantilevered paths on the west side of Bow Back Rivers and completion of the Greenway on the Northern Outfall Sewer Embankment. The NRA supports these proposals and would urge other influencing bodies to support and encourage their implementation and other similar projects. Other actions could include:

- encouraging British Waterways, local authorities and LVRPA to improve existing pathways.
- creating a number of walks or trails that include areas traditionally under utilised for recreational purposes.
- developing under used areas for the purpose of increased recreational activities.

Pros and Cons

The improvement of pathways and towpaths could be impractical if other aspects of an area's environment, such as water quality, are not improved in tandem. Improvements to local areas may be more beneficial to the catchment population than large scale trails which might encourage the development of corridors rather than the whole area. The L.B. of Newham with funding support from the DoE and other partners including private industry, have undertaken a programme of works to dredge and clean rivers and improve towpaths in the Bow Back Rivers area. This has led to improved navigation and wildlife habitat.

Developing under used areas may cause disturbance to breeding birds or specialised habitats, therefore increased use of time and space zoning could help alleviate some of the problems encountered in existing sites.

Water Based Recreation**Options**

- Utilise former gravel pits at Glen Faba for the full range of water sports.
- Develop a 2000 metre international rowing course at the Victoria and Albert Docks.
- Develop a 150 metre canoe slalom course downstream from Dobbs weir on the River Lee.
- Implement the Bow Back Rivers Strategy for long term regeneration and recreation use of the area.

Pros and Cons

By encouraging water based recreation in an area there will be a need for increased accessibility and services for users. This will have the added benefit of the development of under-utilised facilities. The development of such facilities will need to be carefully monitored to ensure that any impacts upon the environment are negligible.

Again, time and space zoning would have to be implemented in order to prevent overcrowding of facilities.

Moorings**Background**

At present moorings exist at Springfield Marina, Hackney, Hazelmere Marina, Waltham Abbey and Lee Valley Marina, Broxbourne. The number of privately owned craft registered on the Lee and Stort Navigations has increased by 40% over recent years (1986-1994), such that there are now over 500 boats registered. BW estimate that each boat only makes an average of 4 movements per year.

Moorings (Continued)

British Waterways, who are responsible for navigation, are promoting the area for recreational purposes such as walking, cycling and wildlife and heritage issues. This also includes policies for increasing the number of moorings that are available.

The LVRPA aims to improve access to the park thus encouraging increased use of existing amenities. In order to meet these increasing demands, it would appear necessary to consider the need for more mooring sites for both residential and recreational craft.

Option

Any proposals put forward for new mooring sites need to be considered in terms of their impact on the environment and their effects on other users and the navigational restrictions that they may cause. There are a number of options that could be utilised to determine the most suitable sites:

- each application made for a site is examined individually by local authorities, British Waterways, NRA and LVRPA.
- British Waterways, local authorities, LVRPA and the NRA, in agreement, could designate specific sites considered suitable and unsuitable for moorings.
- develop specific policies for residential and recreational mooring sites.

Pros and Cons

Any new mooring sites would require easily accessible facilities and services which, if not investigated carefully may prove to be damaging to the environment. With increased moorings available, the movement of recreational craft will be likely to increase, leading to greater lock use. Consideration will need to be given to the capacity of the system, in terms of water availability, if development of moorings is significant.

By encouraging the siting of moorings in more derelict areas, it may be possible to enhance these areas both in terms of facilities and landscape features. The value of this may also be seen in terms of making these areas more secure and safer for general use.

A follow-on effect of suitable mooring sites would be the increased availability of facilities for visitors to the catchment. Residential moorings would also provide more housing facilities and hence greater utilisation of local services.

Background

In the past, a number of non-native plant species were introduced into the catchment including Giant Hogweed (*Heracleum mantegazzianum*), Japanese Knotweed (*Polygonum cuspidatum*) and Himalayan Balsam (*Impatiens glandulifera*). These species are very invasive causing native species to be crowded out and the destruction of natural habitats. Since they are not native species, very few insects, birds or animals are suited to utilising them as habitat or food. These species can colonise many different habitats, but especially river banks. Due to their invasive nature other species are no longer present which in autumn means that when these invasive species die out, the river banks are prone to erosion as bank stability is reduced.

The Giant Hogweed can be considered to be a risk to human health. If the sap from this species contacts the skin it causes hypersensitivity to sunlight resulting in the skin burning and blistering.

Within the catchment there have been a number of successful projects implemented for the removal of Japanese Knotweed. This has been achieved by continual weeding and replacement with native species.

An NRA research and development project has resulted in the production of a booklet 'Guidance for the Control of Invasive Plants near Watercourses'. This identifies suitable methods for dealing with invasive species.

Options

Eradication of invasive species in the Lower Lee catchment will probably be impossible due to the many upstream sources of seeds. However, to ensure that any projects to remove invasive plant species from important areas are successful, a number of options could be followed:

- the most sensitive areas of invasion to be targeted as part of wider improvements to the physical environment
- adjacent land owners to work together to implement a project whereby successive sections of the river are cleared
- existing projects to be extended and built upon.

Pros and Cons

Any clearance of invasive plant species needs to be carried out in conjunction with upstream clearances, as problems may arise when plant debris migrates downstream and spreads. Co-ordination between local authorities, wildlife trusts, riparian owners and interested groups will reduce the likelihood of this occurring.

As most of these species were introduced in the nineteenth century as ornamental plants, they have become quite common throughout the British Isles. The complete eradication of these plants may prove to be not only expensive, but impossible.

The Wildlife and Countryside Act 1981 makes it an offence to plant, or cause, Japanese Knotweed and Giant Hogweed to grow in the wild. Himalayan Balsam is not currently included in this legislation.

Background

The Dagenham Brook is a tributary of the River Lee with a catchment area of 612 hectares. The Brook is 3.4 km long and drains parts of Walthamstow and Leyton which are predominantly urban areas to the east of the brook. Within this catchment, 50% of the area has hard surfaces giving an indication of how densely populated the area is. A significant 15% of this urbanised area is industrialised.

The brook has reaches of earth channel, concrete lined channel and culverts. The earth channel reaches are typically silt bedded with grass and vegetation on the banks and occasionally debris due to the proximity of highly urbanised areas.

The water quality of the brook has been found to be of bad quality according to biological surveys carried out (see Appendix III for further details). Bacteriological data for the brook indicates that it has the highest levels of faecal contamination of any stretch of open 'main' river within the Lower Lee catchment. (See Section 4.1).

The brook is accessible and could be a potential green link through the urban area. Improvements to the landscape, riverside pathways and linkages with other path networks could greatly enhance the brook.

Options

- the London Borough of Waltham Forest has recognised the need for the improvement of this watercourse and is including it in a major area-based bid for central government SRB (Single Regeneration Budget) funds administered by English Partnerships.
- improve the quality of the water by identifying the sources of pollution, particularly bacteriological (e.g. sewage)
- remove the invasive plant species, e.g. Japanese Knotweed and any other plants causing overcrowding of the channel.

Pros and Cons

The brook is within an Objective 2 designated area (see Section 3.13) which increases the likelihood of success for any SRB bids.

The overall landscape value of the area would be enhanced by improvements to the quality of the water and habitats for wildlife. The removal of invasive plant species would also contribute to these improvements. Having enhanced the overall safety of the area, it would then be possible to consider it for projects such as green chain networks and pathways, thus increasing accessibility to the area. Any projects carried out in the area should involve local groups and could be used as a demonstration project on rehabilitation of degraded urban watercourses. The brook is open and accessible which makes it easier for projects to be implemented.

Background

The landscape of several of the river corridors within the catchment is poor because of poor quality buildings and structures and/or vandalism. In heavily urbanised reaches, most buildings have turned their backs on the river, leaving bleak walls or fences as features of the river corridor e.g. industrial areas around the North Circular Road. In some areas, particularly at the southern end of the catchment, some of these buildings are derelict thereby increasing the area's negative image.

Other features such as railway bridges, pipe crossing for gas, water, sewage or electricity and boundary walls can also detract from the rivers visual appearance. There are examples of rusty, poorly painted structures all over the catchment. Some of the NRA's own structures also detract from the visual amenity of the river. These include high security fencing and the painting of weirs and sluice gates in colours that are not readily absorbed into the landscape. The Flood Relief Channel is particularly sterile with few trees and shrubs lining the banks. Improvements to such features can often be relatively cheap requiring only painting or perhaps landscaping in the form of tree and shrub planting.

The Lower Lea Project has begun to look at this problem in the south of the catchment. Premises have been identified as needing improvement and it has been suggested that grants may be available towards the costs of works. The LVRPA is particularly active in bringing about landscape improvements in the Lee Valley with a wide variety of schemes already completed and more planned.

Face lifting works can offer local communities an opportunity to create a distinct identity for certain areas by using, say, certain colour schemes or designs in particular locations. These could be designed by local people, schools etc.

Options

- Identify the negative aspects of visual intrusion within river corridors, especially the Lee Valley.
- NRA to carry out improvements to its own structures.
- Support existing works that are being carried out by LVRPA, Lower Lea Project, etc.
- Encourage the owners/operators to make aesthetic improvements, involving local communities where possible.

Pros and Cons

This type of visual improvement can be relatively inexpensive to tackle and can improve the visual amenity of a river and surrounding area. A lack of cooperation from a single site or utility owner can, however, devalue the work of others.

Background

In order to fully assess the features of environmental value within the catchment data is needed. For example, how many types of flora and fauna exist? Are they rare? Are they particularly good examples or unusual combinations? This data is particularly crucial when areas are, or may be, the subject of development proposals as it is important that the valuable aspects of any site are conserved as an integral part of any such development.

Data is also needed to identify areas of poor conservation value, poor water quality or poor physical habitat and critically to determine why these are poor. Only by doing this can we begin to target actions which will bring about sustainable cost effective improvements.

Specific Locations

Bow Creek, the southern end of the River Lee is inter-tidal. Freshwater from the River Lee meets salt water from the Thames Estuary. Tidal influences extend as far upstream as Lee Bridge. Such conditions are likely to produce valuable and locally rare flora and fauna. However, the NRA currently does not have any detailed information to support this. The situation is compounded by the possibility of considerable redevelopment in the area as it is close to Docklands, the Jubilee Line extension, Stratford and is within the Thames Gateway. Furthermore, there have been proposals for tidal barrages on a number of other tributaries of the River Thames which are likely to impact on the ecology of the habitats as they stand today. Ecological and biological information is therefore essential, and to establish this in advance of any proposals would be of additional benefit.

The River Lee and tributaries around Tottenham have already been the focus of investigation into water quality problems. In order to identify the sources of these problems more accurately and decide on appropriate remedial works, further monitoring is needed of the quality of water from contributing sources. The NRA have already planned six additional water quality monitors at: River Lee at Lea Bridge Weir; River Lee at Carpenters Road, Tottenham Locks; Pymmes Brook at Fore Street, Edmonton; Pymmes Brook just upstream of the confluence with the River Lee, Tottenham Locks; Deephams STW effluent; and, Salmons Brook upstream of Deephams STW. These monitors will automatically log measures of water quality and can be triggered to automatically take samples of the water for collection and further analysis.

Further monitoring of water quality and E.coli (for bacteriological purposes) levels may be necessary in some of the smaller tributaries in order to trace localised sources of pollution. Establishing a comprehensive set of drainage master plans for the urban areas to determine exactly where connections are made between foul and surface water systems will also be necessary.

Sampling of river sediment has been highlighted as necessary (Section 2.5) to determine whether it may be a contributory cause to the water quality problems of the Lower Lee. A particular area of concern is the River Lee Navigation between Tottenham Locks and Lea Bridge Weir.

Investigation of some of the more rural tributaries (e.g. Cuffley Brook) may also be necessary to determine why they are of a poorer standard than would be expected given that there are less impacts from urban run-off.

The NRA is currently developing a computer model for the Lee Valley to evaluate flood risks (see Section 3.15). This work will enable the provision of up to date flood plain maps for local planning authorities as required by Section 105 of the Water Resources Act 1991.

Section 2.6 highlights the need for a comprehensive review of the distribution of water through the Lower Lee. To carry this out, more information will need to be collected about flows in the various river channels of the complex Lee Valley.

Options

- The NRA can carry out some of this additional data gathering, indeed in some cases it may be the only body in a position to do so
- Other bodies can assist with joint investigations and information sharing. For example, British Waterways have done sediment analysis in the past and other agencies may have drainage plans
- Universities and schools may be able to assist with data collection as this could make up an ideal student project.

Pros and Cons

Joint investigations may offer opportunities for cost sharing and spreading of knowledge. However, surveys and sampling must be carried out to consistent standards to be of real value.

Background

The southern part of the Lower Lee catchment has long been an area of poor environmental quality. Furthermore, water courses have been one of the worst aspects of this area, being primarily used for waste water disposal and the conveyance of flood flows in engineered channels. The physical results of this are still evident today. The most common examples are uniform channels, often constructed with concrete banks and bed, or culverted sections of rivers. Such modifications to natural river channels not only reduce their value as ecological habitats, visual amenities and recreational resources, but can also be an added health and safety risk. Anyone falling into a river with steep concrete sides and limited vegetation will have greater difficulty in finding their way out when compared to a natural river with bankside trees, shallow riffles and gently inclined banks.

A few rivers have been totally culverted (e.g. Stonebridge Brook, Tommy Lee Sewers), others have had extensive culverting (e.g. Moselle Brook) whilst most of the smaller streams have had limited lengths culverted. The NRA resists new culverting and the denaturalisation of rivers wherever possible. In the Lower Lee corridor the loss of natural environmental capital in terms of open watercourse has been so great, there is a very strong argument in favour of restoring watercourses to a more natural form. This can be done in a number of ways:

- opening up culverted watercourses when sites are redeveloped
- creating natural features in artificial channels, e.g. mud banks, gravel beds
- replacing concrete banks with sloping natural banks
- replacing straight sections with more natural meanders.

Another feature which reflects nature is the use of on-site storage of surface water run-off. In urban areas rain water passes very quickly through surface water drains into rivers. In undeveloped areas water takes time to soak into the ground (rates will depend on soil types) and accumulates on the natural flood plain, allowing more evaporation and infiltration into the ground. Flood water therefore feeds into rivers at a slower rate. The urban situation could be brought into line with nature by the installation of rain water storage facilities, be they open ponds or underground tanks. These can hold a certain amount of rainwater during a storm. This water can then be slowly fed into the local stream and hence back into the river system. Such facilities are most easily built into new developments or redevelopments but there may be opportunities also to build them into existing drainage systems.

Options

1. No new culverting should be permitted and there should be no net loss of natural watercourse.
2. The NRA and London Borough of Haringey have already recognised the potential to open up culverted parts of the Moselle Brook. This should be implemented as and when opportunities arise.
3. Similarly, the Ching Brook in the London Borough Waltham Forest and Salmons Brook and Pymmes Brook in London Borough Enfield have been identified as green chains. Culverted sections of these rivers should be targeted for opening up and general improvement.

Options (Continued)

4. A list of stretches of river where naturalisation works could take place should be compiled. Your views on any particular reaches would be welcomed along with reasons why they should be done. Once such a list is compiled, consideration could then be given to prioritising and planning such works.
5. Opportunities for overcoming physical barriers to movement should be examined. This could apply where rivers are in concrete channels and have to be fenced off for health and safety reasons. For example, parts of the Flood Relief Channel and Pymmes Brook.
6. New developments should be considered with regard to the appropriateness of on site surface water storage.
7. Criteria should be investigated to determine where, if at all, fitting storage facilities to existing development may be appropriate.

Pros and Cons

Many of the above ideas are expensive or may reduce the amount of land available for development on certain sites. Some of the ideas rely on local planning authorities to implement them through Town and Country Planning legislation.

By starting to implement such policies now we can start to undo some of the damage already caused. Furthermore by having a priority list of schemes worked out on a cost-benefit basis, we may have pro-actively set up the basis for any bids for future European or central government funds for environmental improvements.

Background

The Lower Lee catchment has enormous potential for large scale redevelopment of land. The catchment is also the focus of UK Government and European Union attention for urban regeneration. Five key opportunity areas are described below.

Stratford

The Jubilee Line extension, possible Channel Tunnel Rail Link station and existing good communications mean that large amounts of land with redevelopment potential in this area could be brought forward with positive proposals over the next five to ten years. Stratford also falls within the Thames Gateway. The general area of opportunity could extend south to Three Mills and down to the River Thames and north to Temple Mills, Leyton.

Several groups and partnerships (including the private sector) have been set up to achieve redevelopment, investment and environmental improvements in this area. The environmental works are concentrated in the Bow Back Rivers area. The NRA is keen to see improvements in this area and to support initiatives, although it is not yet heavily involved in the completion of improvements. There appears to be a great deal of activity in this area which must be wholly supported.

Royal Gunpowder Factory (RARDE) Site, Waltham Abbey

This site has been used for the production of gunpowder for several centuries, including supplying the battles of Trafalgar, Waterloo and the American Civil War. The MoD have recently moved their operations off this site leaving a large area vacant. This has a number of very important features; firstly, the northern part of the site is a designated SSSI; secondly, there is a considerable amount of contaminated land, including blue asbestos; and, thirdly, many of the buildings left on the site are of high historical value.

Epping Forest District Council has set up policies for guiding future development of this site in their District Local Plan (Deposit Draft 1994). These enable redevelopment given satisfactory decontamination works and protection of the heritage and conservation value of the site. Additionally, a Gunpowder Museum should be incorporated.

Royal Ordnance Site, Waltham Abbey

Lying south of Waltham Abbey, this site is one which the MoD has been committed to vacating for a number of years.

Again, the Epping Forest District Local Plan lays down policies for the future redevelopment of the site. This requires a new road link to be constructed from the M25 junction 26, to Highbridge Street, Waltham Abbey, and that the southern part of the site is not used for built development.

Royal Small Arms Factory (Enfield Island) Enfield Lock

This is another site which the MoD is vacating. The site recently was moved from Epping Forest District to the London Borough of Enfield as part of local government boundary changes implemented in 1994. The site has been the subject of development proposals for mixed use including light industrial and commercial premises as well as residential areas. A Planning Brief was drawn up for the site in 1989 by Epping Forest District Council, this should ensure that the site is redeveloped as a whole.

Rammev Marsh Sludge Disposal Works. Enfield Lock

TWUL currently still use this site for operational purposes, although it has indicated that the land may become surplus to requirements and available for development. The London Borough of Enfield see this as an area of opportunity which could accommodate a mixed development of residential, business and open space use. Before this could go ahead the feasibility of extracting gravels from the site would be investigated. Given these factors, any development of this site will only happen in the long term.

All of the above five areas are within the Lee Valley and four of them are grouped in close proximity to the M25 at Waltham Abbey. Together they represent opportunities for major change within the catchment. This change will be managed by local planning authorities using Town Planning powers, and we all will have an opportunity to comment on proposals if and when produced, as part of the formal consultation process.

Options

- Individual people and organisations continue to respond to ideas put forward by developers and/or local authorities (i.e. planning briefs).
- Explore ways of ensuring our individual responses are putting forward similar views.
- Use this consultation process to collect views on what we ALL think could reasonably be gained for the water environment from these areas of opportunity.

Establish a strategic, integrated framework for the Lee Valley in which such large scale developments can compliment each other and lead to the overall improvement of the Lee Valley.

Pros and Cons

The first option leaves the possibility of under achieving benefits for the whole catchment though a lack of co-ordination. The second option may be time consuming and will occur when time is shortest. the last two options are proactive approaches which will again be time consuming, but will have widespread support from consultation. In reality the case may arise that different views come forward on each site which cannot be reconciled into a unified approach.

Background

All rivers need nutrients to support flora and fauna. However, large excesses cause significant increases in algae (algal blooms) and weed growth, both of which have detrimental effects in terms of the amenity, aesthetic and ecological value of rivers and lakes and can lead to health hazards in terms of toxins produced by, for example, blue-green algae.

The sources of these nutrients (nitrates, phosphate, orthophosphate and chlorophyll) can come from fertilisers used on agricultural land and effluent from sewage treatment works (STW). The Lower Lee receives water from the predominantly rural upstream catchments of the Upper and Middle Lee and two very large STWs discharge their effluent into the Lower River Lee system.

The process of stimulating excessive plant growth is known as eutrophication and there has been evidence of this occurring within the catchment on some of the lakes and slower flowing rivers, particularly the River Lee Navigation. Indeed in a recent study commissioned by the NRA some reaches were described as hypertrophic, i.e. even greater nutrient levels than in a river that is eutrophic.

Options

- (1) Review the position of the River Lee, and any other affected watercourses, for inclusion under the EC Urban Waste Water Directive (91/271/EEC) Sensitive Areas (Eutrophic) when the Government reviews designated areas in 1997.
- (2) Continue to monitor the nutrient loading on the River Lee to build up data on the existing situation in order that any future improvements can be quantified and demonstrated.
- (3) If (1) above is successful it would then be possible to plan for finances to be set aside to reduce the problem. Typical action could include phosphate stripping at STWs but action may also need to address more diffuse sources of nutrients such as those from agricultural inputs.

Pros and Cons

Progress would appear to be dependent upon recognition by the Government of the need to designate the River Lee as a Sensitive Area (Eutrophic) under EC directive. Failure to do this could delay any progress. There should be a good case for designating the River Lee given its high profile, location within London and large demand for recreational open water and river facilities.

Background

Reed beds have been used to treat polluted water, particularly urban run-off. The NRA is undertaking test projects on the effectiveness of reed beds in order to assess their potential in treating run-off from areas like the urban part of the Lower Lee catchment. In general terms, the reed beds consist of pollution tolerant plants which trap polluted sediment and slow down the flow of polluted water and act as a filter. The plants provide the conditions for bacteria, both aerobic and anaerobic, to thrive. These bacteria break down most of the contaminants through their organic processes. The result is that relatively clean water flows out of the reed bed area.

Reed beds perform a dual function in that they are also areas of wetland habitat. The need for additional wetlands has been highlighted by conservation groups during the informal consultation period.

Options

- (1) Continue research and development in to the optimum design, location and construction of reed beds.
- (2) Identify potential areas for reed bed treatment of polluted stream flow.
- (3) Seek policies on inclusion of reed beds through local planning authorities in development plans and on individual planning applications.
- (4) Examine options for large scale strategic sites for reed bed treatment.

Pros and Cons

Reed beds take up large areas of land. This presents problems in options (2), (3) and (4) above as land take is on specific sites. This could affect land values and development potential. In option (4) it may be difficult to get agreement on, and find land available for, large reed bed areas. Finances will inevitably be difficult but the potential benefits of these kinds of works may be significant.

Background

Some of the rivers in the catchment, particularly in the southern section are prone to the dumping of rubbish and accumulation of litter. This looks unsightly, but can also be a nuisance for boats and a potential pollution and flood defence hazard. Some of the litter occurs through carelessness or neglect whilst other sources may be more deliberate, for example shopping trolleys, household items and stolen cars. Additionally, the tidal influx brings in floating debris from the River Thames.

The generally held view is that litter attracts more litter, in terms of influencing people's behaviour. Therefore in order to reduce litter in the long term, the rivers need to be kept as free as possible of litter.

Options

- (1) Regularly clear up litter from rivers. This could be done by a variety of voluntary and statutory groups.
- (2) Regular clearance of large items of debris by organisations such as the NRA and British Waterways.
- (3) Clearer reporting mechanisms to be set up to alert groups to particular problems.
- (4) Booms or litter traps could be installed at locations where debris is a continual problem, particularly from tidal influxes.

Pros and Cons

Picking litter from rivers is an extremely labour intensive, and therefore costly, activity. It would be difficult to justify large expenses on any single body. There may be scope for improving response times when dealing with single large items of debris, especially as these can prove to be problems for navigation and flood defence reasons.

Background

Although the River Lee and the Lee Valley is the main focus of the catchment, there are many important tributaries which have their own particular character, features and issues, albeit on a more localised scale.

Nazeing Brook

There have been incidents of localised flooding along Nazeing Brook, including recent events in 1987 and 1983. These have occurred despite flood alleviation works carried out by both the NRA and Epping Forest DC. In the 1993 flood, tens of thousands of pounds worth of damage was sustained to property in the Nazeing area. In the light of this, there is a need to review the standard of protection from flooding for Nazeing.

Options

- Examine the causes of flooding problems.
- Seek possible remedies, including ideas put forward by local residents and pursue schemes which offer benefits in excess of their cost.
- Do nothing.

Pros and Cons

Flooding presents major problems for those affected and it is clearly desirable to prevent it where possible. However, any works proposed need to be assessed on a cost benefit basis along with any environment impacts they may have.

Woolens Brook, Spital Brook, Turnford Brook, Rags Brook, Theobalds Brook

No specific issues have been raised on these Brooks.

Cuffley Brook

Cuffley Brook is essentially a rural stream with relatively natural habitat along much of its length. The only urban influences are from Cuffley and the M25. However, it has been assessed as being poor water quality and therefore its provisional Water Quality Objective is also low (RE5). This is the same as some of the worst sections of the River Lee which receive very large amounts of urban run-off. Biological sampling has also highlighted this river as being of poor quality.

This is of particular concern as the Cuffley Brook flows into the Turkey Brook which is of fair to good water quality. Part of the problem may be that Cuffley Brook is ephemeral (naturally dries up) in its upper reaches.

Options

- Investigate the causes of the poor water quality in Cuffley Brook.
- Examine options for revising the PWQO for the Brook upwards to reflect the expectations for this river.

Pros and Cons

Relatively natural rivers such as this one should not be accepted as being of poor water quality. If quality problems are due to natural phenomena, then this must be recognised but not used as an excuse for continuing poor water quality.

Turkey Brook

No specific issues have been raised regarding this Brook.

Cobbins Brook

There have been both water quality and flooding problems on the Cobbins Brook. The biological surveys of the Brook indicate that it is a poor habitat with limited biological diversity, despite being relatively natural upstream of Waltham Abbey with many meanders. The water quality may be affected by the chemicals used in the greenhouse industry which has historically been located in this part of the catchment.

Within Waltham Abbey there have been flood alleviation works carried out to reduce flood risk. These have resulted in artificial channels with vertical concrete banks. Localised flood still persists.

Options

- Investigate causes of pollution in the Cobbins Brook.
- Examine causes of flooding, including the impacts of new developments and examine a full range of options for reducing the risk. Recent reviews of investigations have demonstrated that the cost of further action exceeds the benefits.
- Seek opinion on the desirability and feasibility of improving the physical habitat of the river through Waltham Abbey, both in terms of public amenity and natural habitat.

Pros and Cons

The Cobbins Brook presents a range of difficulties, all of which are issues but which at present are not considered priorities. From a catchment wide perspective this would make the Cobbins Brook a low priority, unless particular public interest could be established.

Salmons Brook

Salmons Brook has its head waters in the Green Belt and flows through Enfield and Edmonton. It accepts Deephams STW effluent just before its confluence with Pymmes Brook. Water quality is generally fair throughout much of the Brook's length with reaches of good biological diversity in the upper reaches. It is designated as a Green Chain by the L.B. Enfield UDP, although several sections are culverted and have limited public access.

Options

- Examine options for opening up culverts and naturalising the river channel, particularly when redevelopment occurs.

Options (Continued)

- Ensure that water quality remains fair and seek measures for improvement where possible.

Pros and Cons

This river actually performs reasonably well for an urban river, and whilst this means there may not be pressing problems to be addressed, it also has the benefit that further improvements may be feasible to make it a fully functioning Green Chain with both amenity and wildlife value.

Pymmes Brook

Pymmes Brook is a more urbanised river than the Salmons Brook and exhibited more acute problems. From its first contact with the urban area (East Barnet), it is degraded by poor water quality and engineered river channels. This is in spite of the river flowing through many areas of open land including Oak Hill Park, East Barnet, Arnos Park, Southgate, Pymmes Park, Edmonton and Tottenham Marshes, Tottenham, as well as the Muswell Hill golf course and St. Pancras and Islington cemetery which lie on the Bounds Green Brook.

Misconnections (the connection of foul water pipes, toilets, washing machines, dishwashers etc. to the surface water system and hence direct to rivers), are known to be a problem along much of the Pymmes Brook and its tributaries. Particular problem areas are thought to be East Barnet and Muswell Hill. This is supported by measured levels of bacteria. The London Borough of Barnet, Drainage Department, carried out some investigations into this problem and achieved limited success. Tracing sewer pipes is a labour intensive and expensive activity.

Pymmes Brook is also identified as a Green Chain in L.B. of Enfield's UDP. Clearly the river's amenity and ecological value is restricted by poor water quality and concrete banks. The physical structure of the river is a greater problem in the downstream reaches through Edmonton and Tottenham where it has been fenced off in places and presents a barrier to movement.

Options

- Investigate more closely the causes of poor water quality, including targeting action on misconnections.
- Look for opportunities to improve the amenity value of the river particularly within areas of open land. This could include involving local volunteer groups and schools.
- Carry out research into the feasibility of localised reed bed treatment for polluted rivers. Possibilities may include areas of open land on the Pymmes Brook and its tributaries.
- The North Circular Road (Telford Road), New Southgate is due to be considered for widening. Improvements to Bounds Green Brook could be included in this scheme.

Pros and Cons

Given the poor current state of much of the Pymmes Brook it may be difficult to gain all round support for actions which could be relatively expensive. Although the fact that the river is generally quite accessible and flows through public parks should help to raise its profile.

Moselle Brook

The Moselle Brook and its tributaries are mostly culverted. From the sources around Highgate, East Finchley and Muswell Hill, through Hornsey, Wood Green and Tottenham there are only two significant sections of open watercourse at Lordship Recreation Ground and Tottenham cemetery. This fact has been recognised by the L.B. Haringey and their UDP highlights the route of the Brook as being a potential Green Chain. The water quality in the Brook is amongst the worst in the catchment. This problem is reflected in very high bacteria levels, particularly from the upstream sections of the Moselle in Highgate and Hornsey and very poor biological quality. Water quality is exacerbated by the lack of open reaches of water which would allow plant growth and natural breakdown of at least some of the pollutants.

Options

- (1) Pursue opportunities to open culverted sections of river, particularly with redevelopment proposals.
- (2) Investigate sources of pollution and remedies.
- (3) Do nothing.

With such a decimated river, it may be hard to envisage a return to a semi natural state of ecological and amenity value. However, to take Option (3) is an unsustainable approach. Given that this area is generally short of open space it makes the possibility of recreating what was once a natural stream even more important. It must be realised that it is likely to take a long time to achieve this, but it has taken 150 years of progressive urbanisation to achieve the current position.

Ching Brook

The Ching Brook has been identified in L.B. Waltham Forest UDP as a Green Chain. It has some sections of culverted river and restricted access. Again, it drains a large urban catchment and biological quality is poor although there have not yet been severe problems reported with water quality.

Options

- Press for opening up culverts and improvements to the river corridor and access in line with the Green Chain designation.

Pros and Cons

As no new issues have been raised on this Brook, this action represents a continuation of the current approach, but more widespread support for this could change the emphasis placed on improving the river corridor.

The catchment has already been identified as needing action to bring about real physical, social and economic improvement. Below is a list of proposed projects by the London Boroughs, British Waterways, Lee Valley Regional Park Authority and other active bodies which aim to improve the environment of the Lower Lee catchment particularly for recreational use. Finance has been sought from a wide variety of government, European and other grants and trusts.

TABLE 1 : COMPARISON OF PROGRAMMED PROJECTS WITH ISSUES IN THE LOWER LEE CATCHMENT.

Project Details	Issues
Rammey Marsh, Landscaping and Access improvements.	Landscape, Amenity & Recreation, Poor Physical Environment, Major Development Planning
Swan & Pike Pool, Enfield Lock, Car Park/Picnic/Access/improved environment	Landscape, Amenity & Recreation
Enfield Lock Bridge, Open up pedestrian and cycle access to area	Amenity & Recreation
Circular Walks to Messups Creek and Turkey Brook	Amenity & Recreation
Tottenham Marsh Improvements - Landscaping and Access	Landscape, Amenity & Recreation, Contaminated Groundwater, Tributaries
Tottenham Marsh Further Improvements. Toilet Facilities, event areas etc	Amenity & Recreation
Folley Lane to the river - linking footpath and cycleway joining the Park path	Amenity & Recreation
West Leyton: Dagenham Brook, Temple Mills. Linked footpath with landscaping scheme.	Landscape, Amenity & Recreation, Invasive Plant Species, Water Quality, Poor Physical Environment, Reed Bed Treatment, Litter & Debris
Brimsdown Lee Navigation Corridor improvements including Messups Creek	Litter & Debris, Landscape, Amenity & Recreation, Poor Physical Environment
Lee Valley Reservoir Banks, Landscaping to base of reservoirs as a gateway to the Valley	Landscape
Lee Valley Trading Estate, North Circular Road. Wharf & towpath environmental enhancements	Landscape, Amenity & Recreation
Lea Bridge Road. Phase 2, Landscaping improvements at a gateway	Landscape
Lea Bridge Road. Phase 3 Landscape improvements to car park and south side of road	Landscape
Hackney Wick Community Forest	Landscape, Poor Physical Environment

Residential Moorings - Salmon Lane Stepney. Development of vacant site to provide permanent residential moorings and riverside facilities	Amenity & Recreation
Victoria Park Wharf feasibility study to investigate creation of new mooring basin at Victoria Park Wharf.	Amenity & Recreation
Victoria Park Wharf. Excavation new basin for residential mooring with improved facilities and access	Amenity & Recreation
Graffiti removal.	Landscape
Stonebridge Lock, Tottenham. Provide a new marina with recreational facilities	Amenity & Recreation
Floating Market at Tottenham Hale with Chinese Centre, restaurant and training school	Amenity & Recreation
Wetlands Heritage Centre, Lea Bridge Road - interpretation centre and nature reserve on old water filtration site	Poor Physical Environment, Amenity & Recreation
Three Mills setting. A package of environmental schemes to improve the setting of listed buildings and to enhance / develop disused sports ground for events, information, recreation and wildlife	Landscape, Amenity & Recreation, Poor Physical Environment
Heritage Trail. A 'Birthplace of Technology' trail covering the whole of the Valley.	Amenity & Recreation
Lea Bridge Road underpass - improve pedestrian access to open spaces and provide a safe north / south route	Amenity & Recreation
Bridge to link Hackney Marsh to Essex Filter Beds as part of pedestrian access to area	Amenity & Recreation
Improvement to boating club facilities to attract user groups to the river and to develop further water based and other training courses. Bankside improvements.	Amenity & Recreation, Poor Physical Environment
Bow Flyover. Pedestrian Link under Bow Flyover to join existing pedestrian routes	Amenity & Recreation, Poor Physical Environment
Bow Housing Action Trust improvements. Environmental improvements to Hertford Union Canal side.	Landscape
Wellington Boat Club, Tower Hamlets. Scheme to establish boating / canoeing club on Regents Canal. Provision of changing rooms.	Amenity & Recreation

Regents Canal Towpath improvements linking Mile End Park and Victoria Park to Limehouse Basin and the Thames as part of a green corridor strategy and development of a regional footpath	Amenity & Recreation
Limehouse Cut Towpath. Improvements linking Limehouse basin to River Lea.	Amenity & Recreation
Lea Valley minor landscaping, planting of reed beds, excavations of Roman Ford, signage etc	Landscape, Reed Bed Treatment, Amenity & Recreation, Invasive Plant Species
Pedestrian Bridge over canal near Queen Mary and William college, Mile End. Bridge to enable pedestrians on the west side to gain access to towpath and Mile End Park.	Amenity & Recreation
Improvements to Bridge / links to Hertford Union Canal from Four Season Park and Yellup Yard. Provide a pedestrian link from railway line to eastern end of Hertford Union Canal with Landscaping.	Amenity & Recreation
New Canal side link on west side of Regents Canal from Old Ford to Roman Road	Amenity & Recreation
Footpath / cycleway network. Improving links, providing signage and interpretation along the river corridor and into Stratford and West Ham. Feasibility study to examine pedestrian and cycle links from Bully Fen to residential areas.	Amenity & Recreation
Maintenance Team. A range of works to realise the leisure, and recreational amenity, and ecological potential of the river and its corridors including works to enhance navigation potential, water safety and ongoing river cleanup principally through the maintenance team.	Amenity & Recreation, Landscape, Litter & Debris, Poor Physical Environment, Invasive Plant Species
Nature Conservation Trail within the Lee Valley Park	Amenity & Recreation, Poor Physical Environment
Sculpture Trail within the Lee Valley Park's Enfield area.	Amenity & Recreation
Improved signage and Valley identity, within the Lee Valley Park.	Amenity & Recreation
Feasibility and then upgrade Park path to cycleway where immediately practical	Amenity & Recreation
Access to Park Path from Tower Hamlets along link adjacent to Hertford Union Canal with two crossing points into Newham.	Amenity & Recreation

Picketts Lock, Edmonton. Bank protection works. Regrading of waterside margins to reduce erosion and increase conservation interests.	Poor Physical Environment, Landscape
Lee Park Way. Re-profiling of banks to increase accessibility and enhance conservation interest.	Amenity & Recreation, Poor Physical Environment
Tottenham Marsh Scrape. Provide an area for bids and experimental method of dealing with pollution problems	Landscape, Water Quality, Reed Bed Treatment, Poor Physical Environment
Re - introduce Black poplar on the bankside at North Marsh. Conservation of a threatened tree.	Landscape
Walthamstow Marsh recreation of ditch to enhance wildlife interest	
Limehouse Cut Towpath. Improvements linking Limehouse basin to River Lee.	Contaminated Groundwater, Amenity & Recreation
Bow Locks. Improvement to the locks to facilitate commercial traffic on the river and to reduce tidebourne pollution.	Litter & Debris, Water Quality
River Cleanup Campaign. Study of sources of pollution in the river area. Dredging to remove historic pollution in river bed.	Water Quality, Amenity & Recreation, Nutrient Enrichment, Reed Bed Treatment
Study & Pilot to determine an economic and sustainable way of dealing with problems of road water run off polluting the river.	Water Quality, Litter & Debris, Tributaries, Poor Physical Environment, Amenity & Recreation, Dagenham Brook, Reed Bed Treatment

TABLE 2: HOW THE ISSUES MEET THE THEMES OF THE VISION

VISION THEME	ISSUE						
	Communication between active groups	Contaminated Land in the Lower Lee	Water Quality downstream of Tottenham	Water Levels	Recreation and Amenity Facilities	Invasive Plant Species	Dagenham Brook
COMMUNICATIONS AND CO-ORDINATION <ul style="list-style-type: none"> • sustainability through co-ordination • effective communications 	• •	• •		•	•		•
RAISING OUR SIGHTS <ul style="list-style-type: none"> • breaking the cycle of decline • raising expectations • raising awareness 	• • •	•	• •			•	• • •
CATCHMENT QUALITY <ul style="list-style-type: none"> • protecting and enhancing the Lee Valley and associated water environment • health and safety • balancing interests 		• •	• • •	• • •	• •	• •	• • •

TABLE 2 (Continued)

VISION THEME	ISSUES							
	Landscape of the Lower Lee	Need for more baseline data/monitoring	Poor Physical Environment	Planning for Major Development	Nutrient Enrichment of Rivers	Reed Bed Treatment	Litter and Debris	Tributaries
COMMUNICATIONS AND CO-ORDINATION <ul style="list-style-type: none"> • sustainability through co-ordination • effective communications 			• •	• •			•	• •
RAISING OUR SIGHTS <ul style="list-style-type: none"> • breaking the cycle of decline • raising expectations • raising awareness 	• •		• •	• •	•	•	• •	• • •
CATCHMENT QUALITY <ul style="list-style-type: none"> • protecting and enhancing the Lee Valley and associated water environment • health and safety • balancing interests 	• •	•	• • •	• •	•	• •	•	• •

The purpose of this section is to describe the physical resources of the catchment, the uses we make of the water environment and the activities that affect it.

Bold text in italics on a shaded background indicates a matter that we feel may justify further action. These matters are brought together in Section 2.

The northern extent of the Lower Lee catchment is marked by the confluence of the River Stort with the River Lee at Hoddesdon; the River Thames marks the southern limit. The urban character of Greater London dominates the catchment, but there are also other significant urban areas including Waltham Abbey, Cheshunt and Hoddesdon as well as some more rural areas in Hertfordshire and Essex. Nearly all of the land outside the existing urban areas is designated Metropolitan Green Belt under Town and Country Planning legislation in order to prevent the further spread of London and the merging of settlements.

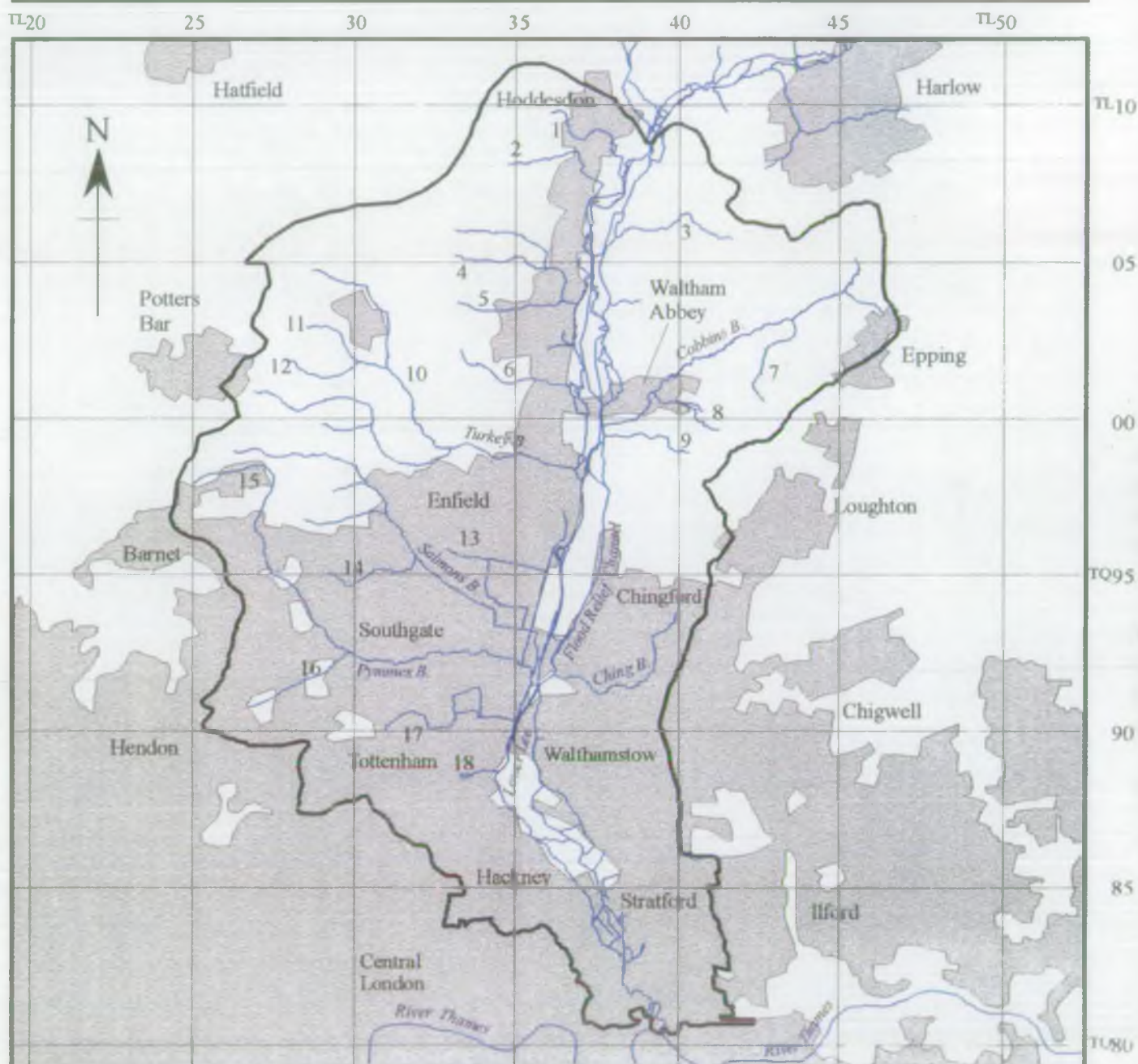
Major uses of water within the catchment include water abstraction for public water supply. This incorporates the system of reservoirs in the Lee Valley between Enfield and Tottenham which are used for water storage. The River Lee is also used for sewage effluent disposal. There are two major sewage treatment works that affect the catchment, these are Rye Meads (near Hoddesdon) and Deephams (near Edmonton). NRA surveys indicate that river water quality is generally fair although the River Lee between Tottenham Locks and Lea Bridge is of poor quality.

The rivers, reservoirs and associated areas of open land are also heavily used for recreation. The Lee Valley Regional Park Authority manage a major part of the Lee Valley for recreation with a catchment population numbering millions from London, Hertfordshire, Essex and beyond. As such, the park is a regional recreation resource. British Waterways (BW) are responsible for the Lee Navigation and actively promote its recreational use. Angling on both the waterways and the reservoirs and gravel pits is very significant.

In addition, these areas of open water, rivers, reservoirs and adjacent wetlands, offer important refuges for wildlife. The conservation value of several of these areas is recognised by both national (e.g. Sites of Special Scientific Interest) and international (e.g. Special Protection Areas) designations. The Lee valley is an important route for migratory birds.

The low lying land along the Lee valley has historically been prone to severe flooding. The last incident in March 1947 inundated an area of some 3,500 hectares (8,500 acres) and flooded thousands of properties, closed main roads and contaminated drinking water supplies. The physical damage caused was never fully calculated. Considerable human hardship, misery and inconvenience resulted. The valley now has a high degree of flood protection due to the construction of the River Lee Flood Relief channel which was completed in the 1970s. It is critical that this level of protection is maintained in order to minimise the risk to public safety and damage to property. The southern-most rivers in the catchment are also tidal with considerable variations in their depth between high and low tide.

There are also many smaller tributaries joining the River Lee within the catchment. These rivers are also critical as they provide more localised resources for amenity, wildlife, storm water and sewage effluent disposal. Furthermore, they are often key features for local communities with many streets and parks being named after them. Many of these streams, but particularly those within urban areas, have also had a history of flooding problems. Rivers like Pymmes Brook, Salmons Brook and Cobbins Brook, have had flood alleviation works undertaken on them. Many stretches of smaller streams have also been culverted (enclosed in a pipe) to enable land to be built upon.



KEY

	Watercourse	Main River Tributaries		
	Catchment Boundary	1. Woolens Brook	8. Honey Lane Brook	15. Monken Mead Brook
	Urban area	2. Spital Brook	9. Quinton Hall Brook	16. Bounds Green Brook
		3. Nazeing Brook	10. Cuffley Brook	17. Moselle Brook
		4. Turnford Brook	11. Hemphill Brook	18. Stonebridge Brook
		5. Rags Brook	12. Northaw Brook	
		6. Theobalds Brook	13. Saddlers Mill Stream	
		7. Copthall Brook	14. Hounsden Gutter	

Scale (approx)
0 5 km
FILE REF: LLMAPCO PRE REV 5.2 (1991)

TABLE 3: KEY STATISTICS FOR THE CATCHMENT

Catchment Area	380 km ²
Population	1 175 000
Length of main river (maintained for flood defence purposes by the NRA)	300 km
Length of navigable river/canal (including Bow Back Rivers)	47 km
Number of Local Authorities	16

Actions affecting the water environment within the catchment are promoted, controlled and carried out by a multitude of agencies, authorities, groups, companies and individuals. These range from international influences like the European Union (EU) down to the very local level, for example an allotment society. Each of these will have their own particular aims and objectives which may, or may not, be guided by the aims of other bodies. Together these bodies make up the 'management' of the catchment.

Statutory Bodies

The National Rivers Authority is the statutory body for the protection and enhancement of the water environment. Our mission statement is on the inside front cover of this document.

The Lee Valley Regional Park Authority (LVRPA) was established by an Act of Parliament in 1966 to develop, improve and manage, leisure and recreation facilities and nature reserves within the Lee Valley. It covers an area of around 4,000 hectares (10,000 acres) and has substantial land holdings within the Valley. The Park's area of jurisdiction is shown in Section 3.10. The Lee Valley Park Plan 1986 sets out the Authority's objectives, policies and proposals. This is currently being reviewed.

British Waterways (BW) is the statutory body responsible for navigation on the River Lee Navigation and the canals in the catchment. BW carry out maintenance work on the Lee Navigation. This includes dredging, lock repairs, bank protection, towpath works and sign posting. BW actively promote the use of canals and the River Lee Navigation for recreation.

The London Planning Advisory Committee (LPAC) came into existence in 1986 to replace the strategic planning functions of the Greater London Council. It advises London Boroughs on their approach to their Unitary Development Plans (UDPs) and informs Central Government of Boroughs' policies and views. LPAC produced their guidance (Strategic Planning Guidance for London), after formal consultation, in 1994.

Statutory Bodies (continued)

There are 16 local authorities within the Lower Lee Catchment, two of which are the County Councils of Hertfordshire and Essex (see map on previous page). These County Councils act in a similar way to LPAC in respect of land use issues by setting the land use context for District Councils, but they also have direct control over matters such as education, waste disposal and minerals excavation. The London Boroughs and District Councils have responsibility for a wide range of local services including land use planning, environmental health and waste collection for their own particular areas, although there is co-operation over specific issues that require cross boundary co-ordination.

There are also several Central Government departments which have a role to play in the water environment. The Department of Environment (DoE) sets the overall policy guidance for other bodies such as local authorities to work within. The Department of Transport (DoT) is responsible for transportation proposals and policies. The Ministry of Agriculture, Fisheries and Food (MAFF) and Department of Trade and Industry (DTI) are also active in mainly farming and economic regeneration respectively. These responsibilities are co-ordinated for the area by the Regional Government Offices for London and the South-East of England.

There are several quasi-governmental organisations (QUANGO's) apart from the NRA which have responsibilities within the catchment. English Nature (EN) is concerned with nature conservation and there are several areas of particular value within the catchment (see sections 3.6 and 4.3). English Heritage (EH) are concerned with the conservation of the built environment (see section 3.8). Other organisations such as the Sports Council (SC) and Recreation (ECSR) and Countryside Commission (CC) also have specific interests in the catchment.

TABLE 4: DISTRIBUTION OF CATCHMENT AREA AND POPULATION WITHIN THE LOWER LEE CATCHMENT.

LOCAL AUTHORITY	PERCENTAGE OF CATCHMENT		LOCAL AUTHORITY	PERCENTAGE OF CATCHMENT	
	AREA	POPULATION		AREA	POPULATION
GREATER LONDON	55.13	89.61	HERTFORDSHIRE CC	23.00	7.63
LB Barnet	5.52	7.37	Broxbourne BC	13.54	6.64
LB Enfield	21.36	22.08	East Herts DC	3.14	0.13
LB Hackney	4.39	13.33	Hertsmere DC	1.06	0.42
LB Haringey	7.29	15.68	Welwyn Hatfield DC	5.32	0.42
LB Islington	0.03	0.04			
LB Newham	4.21	9.65	ESSEX CC	21.79	2.75
LB Redbridge	0.36	0.15	Epping Forest DC	21.79	2.75
LB Tower Hamlets	1.53	3.30			
LB Waltham Forest	10.44	18.01			

Clearly the range of local authorities within the catchment presents its own problems co-ordination and communication. Some authorities, like Broxbourne, Enfield, and Waltham Forest, are wholly within the catchment and can be expected to place great emphasis on the Lower Lee area. Other authorities such as Hertsmere, Welwyn Hatfield, Islington and Redbridge only have a small portion of their area within the catchment.

Statutory Bodies (continued)

These authorities are not likely to place such a high emphasis on the Lower Lee area. Furthermore, the concerns of inner London Boroughs are different to those covering Green Belt area.

Most county councils and local authorities have recently revised, or are currently revising, their statutory land use development plans. These documents give detailed policies for controlling development (i.e. how to treat planning applications). When considered in conjunction with Regional Planning Guidance for the South-East of England (prepared by Central Government) and LPAC's advice, these documents provide the best means of establishing possible future land use trends (see section 3.13) which have an impact on, or interact with, the natural water environment.

The NRA and the other statutory consultees are consulted over planning applications which affect their interests. This gives these bodies the chance to make representations regarding each such planning application. The planning authority must have regard to the views of the consultees, but does not necessarily have to follow their advice.

The following are the relevant land use development plans:

Structure Plans

Hertfordshire	(2nd Alteration 1992)
Essex	(2nd Alteration 1994)

District Local Plans/Unitary Development Plans

LB Barnet	(Adopted 1991)	LB Haringey	(Deposit 1993)
Broxbourne BC	(Deposit 1992)	Hertsmer DC	(1st Review 1991)
East Herts DC	(Adopted 1993)	LB Newham	(Deposit 1993)
LB Enfield	(Adopted 1994)	LB Redbridge	(Adopted 1994)
Epping Forest DC	(Deposit 1994)	LB Tower Hamlets	(Adopted 1992)
LB Hackney	(Deposit 1992)	LB Waltham Forest	(Deposit 1992)
		Welwyn Hatfield DC	(Adopted 1993)

Water Supply and Sewage Disposal

Thames Water Utilities Ltd (TWUL) operations constitute a significant land use within the catchment. TWUL supply fresh water and take away foul water from our homes, work, shops, etc. (see section 4.2). To this end, it uses a significant proportion of the catchment for water storage, sewage treatment and water treatment works. Some of these areas are now utilised for recreation and provide valuable conservation and environmental areas.

Non Statutory Bodies

There are a range of national and local groups which have been set up for specific purposes such as the Royal Society for the Protection of Birds (RSPB). The Lower Lee Project is concerned with the environmental regeneration of the network of tidal and semi-tidal rivers in the south of the catchment known as Bow Back Rivers. They carry out environmental works on the ground, often utilising voluntary labour, schools and the remand prison service.

Other bodies include environmental pressure groups such as Friends of the Earth (FoE) who have active local groups, the London, Herts and Middlesex, and Essex Wildlife Trusts and specific area based groups like the Walthamstow Marsh Society. Local amenity and interest groups such as Enfield Lock Conservation Group, angling clubs, canal users (e.g. Lea and Stort Planning and Amenities Forum) and boating groups are concerned with the water environment and have an important role to play.

Partnerships between groups have been set up in response to specific initiatives, for example the City Challenge schemes in Stratford and Dalston, the "Lee Valley Objective 2" team and European life bids which are all competing for UK government and European funds (see section 3.13) for urban regeneration and environmental improvement. These groups tend to draw on representatives from already established groups and statutory bodies to help formulate ideas and deliver joint action. In this respect, they provide an essential focus for agreeing local needs. However, these groups may only exist for a set timescale.

Together this wide collection of bodies (there are many others that are not mentioned above, but have been contacted during the compilation of this report - see Appendices II and V) make up the diverse and complex structure of management and for the Lower Lee catchment.

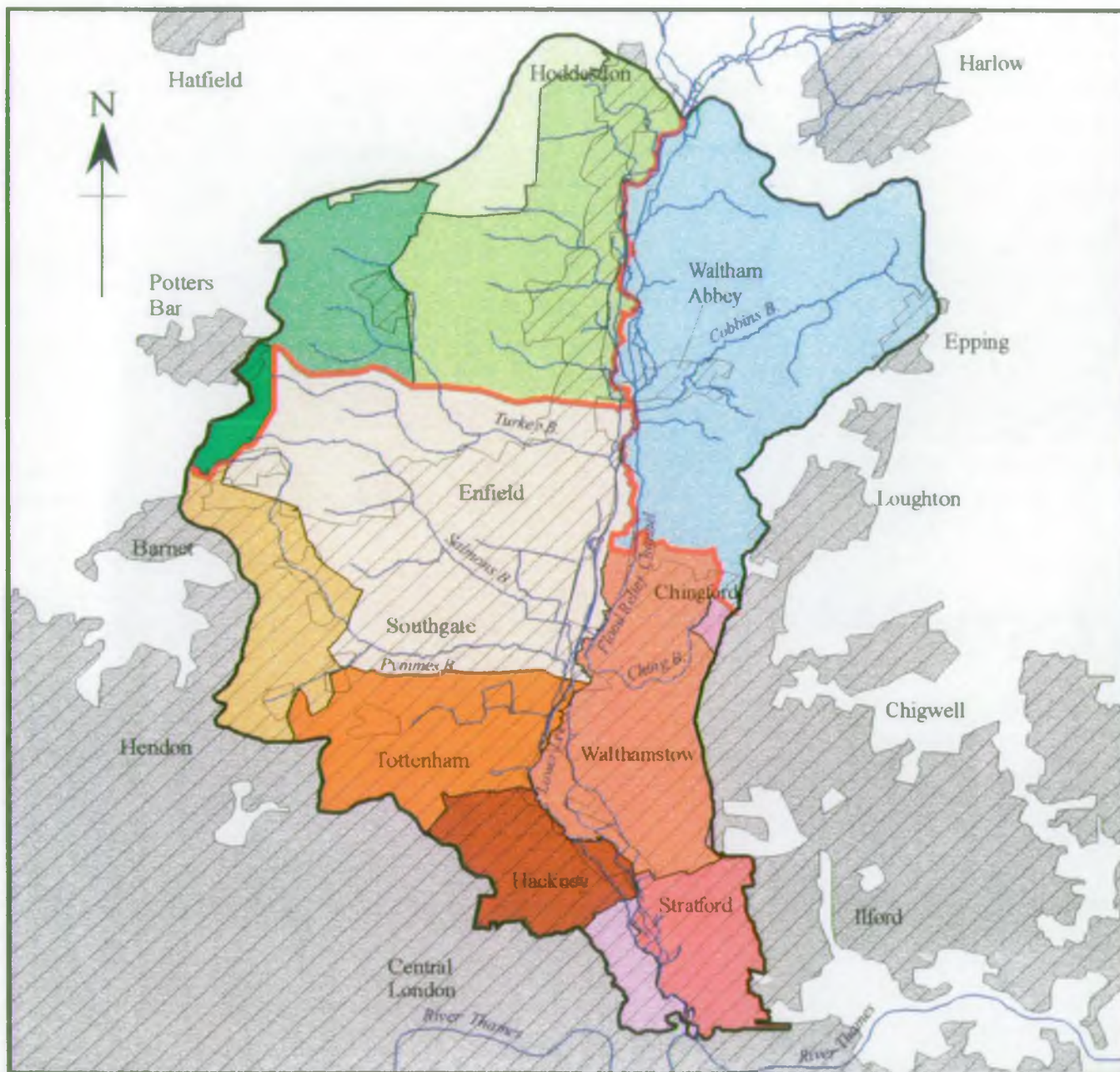
It is clearly desirable that the various actions and policies of these bodies firstly, do not conflict and, secondly, pull in a similar direction. This is obviously difficult as the organisations have varying aims, objectives and political and financial influences.

Existing strategies


















Several organisations have also developed strategies relevant to the water environment. These include:

- 1) Zone 4 Water Recreation Strategy (Eastern Council for Sport & Recreation, July 1994)
- 2) An Environmental Strategy for Hertfordshire (Herts CC, 1993)
- 3) Policy for the Environment (LB Newham, 1992)
- 4) Barnet Environmental Strategy (LB Barnet, 1993)
- 5) Heritage Protection Policy for Essex (Essex CC, undated)

Since the United Nations Earth Summit in June 1992 local authorities have been considering their response to Agenda 21 which encourages wider access to environmental information, greater community participation in decision making, and adoption of sustainable development principles. A number of environmental audits and strategies have now been produced (such as those described above). The NRA will continue to assist local authorities with this work.



KEY

	Watercourse	HERTFORDSHIRE		GREATER LONDON			
	Catchment Boundary		East Hertfordshire		Enfield		Hackney
	Urban area		Broxbourne		Barnet		Tower Hamlets
	County Boundary		Welwyn Hatfield		Haringey		Newham
ESSEX			Hertsmere		Waltham Forest	<div>Scale (approx)</div> <div>0 ————— 5 km</div> <div>FILE REF: L1MAPC01 PRE REV 6 14/01/95</div>	
	Epping Forest				Redbridge		

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We have defined the boundary of the catchment to include all land which drains surface water run off (ie rainfall which flows by gravity over the land surface to a watercourse) to the River Lee downstream of Feildes Weir. This includes the land drained by the tributaries of the River Lee. This is relatively easy to define in rural areas where the top of a hill will mark a divide in the direction of water flow.

However, in built up areas like London, much of the surface water goes into sewers before being discharged into rivers. These sewer pipes do not necessarily follow the lie of the land and so the catchment boundary has been defined by examining the direction of flow of the surface water sewers as well as using ground levels.

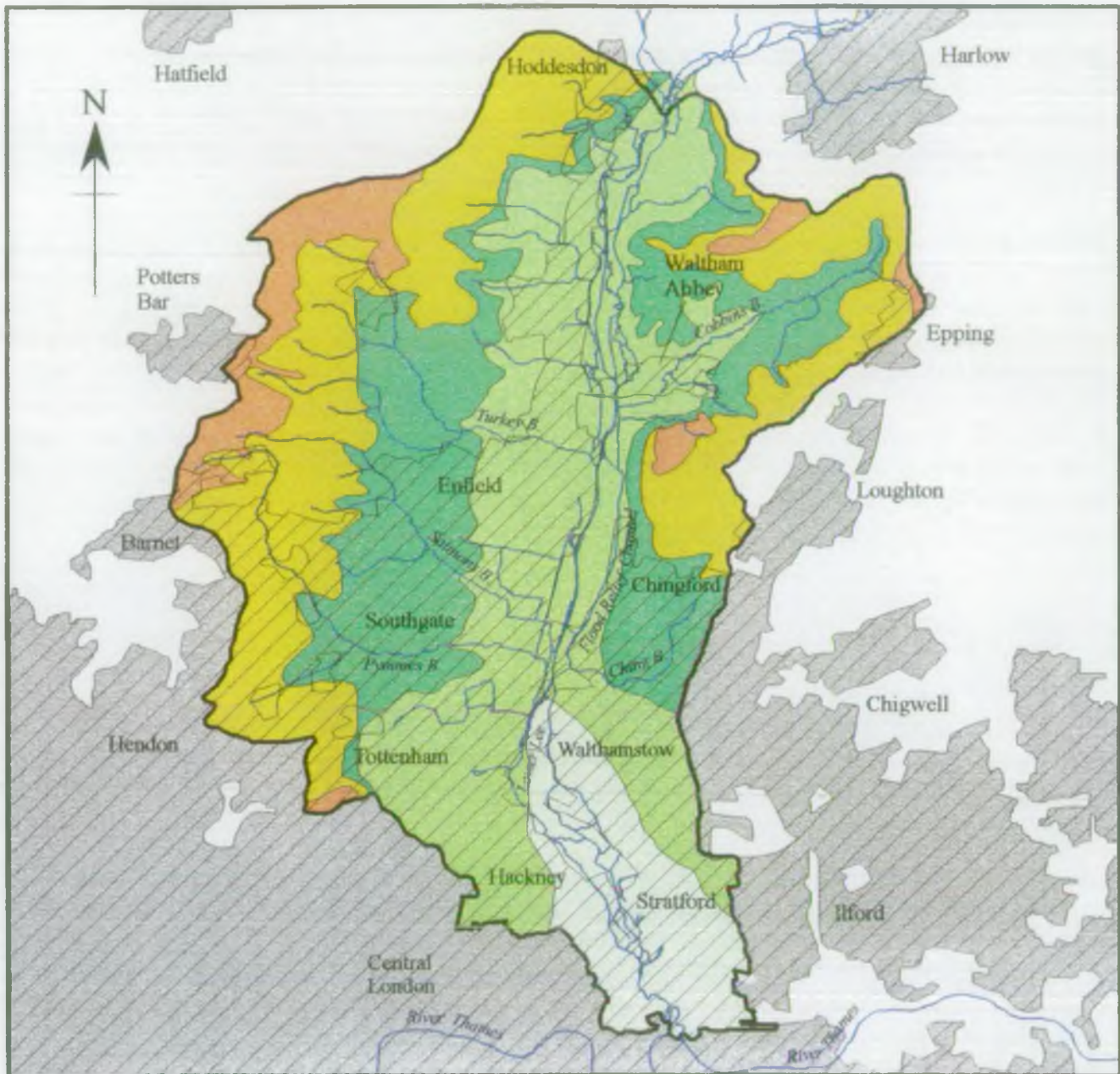
The main rivers drain in a general southerly direction towards the River Thames although some of the tributaries to the River Lee flow in from hills in the west and east of the catchment. The highest areas of the catchment are found in the north, with heights of up to 125 m Above Ordnance Datum (AOD) around Potters Bar and up to 115 m AOD in Epping Forest. Most of the London area is on lower lying land, typically 30 - 60 m AOD. Other high points include Alexandra Palace at 90 m AOD and Highgate Hill, which is on the western boundary of the catchment, at 130 m AOD.

The land closer to the main River Lee corridor is considerably lower. Most of this land is low lying flood plain and is typically around 30 m AOD at Hoddesdon, 20 m AOD near the M25 and below 10 m AOD at the southern end of the catchment.









The River Lee itself falls approximately 25 m from Feildes Weir to its confluence with the River Thames. Given that this is over a distance of approximately 34 km this gives an overall gradient of about 1 in 1300, which is very shallow.

Most of the tributaries of the River Lee are considerably steeper, the approximate gradients include:

Pymmes Brook	1 in 150
Ching Brook	1 in 240
Cobbins Brook	1 in 170
Spital Brook	1 in 200.



KEY

	Watercourse	GROUND LEVELS					
	Catchment Boundary		Under 10 m		70 to 100 m		
	Urban area		10 to 40 m		Over 100 m	<div>Scale (approx)</div> <div>0  5 km</div> <div>PR 2 977 LLMAPCC4.PRX REV 5.1 18/01/95</div>	
			40 to 70 m	All values in metres AOD (Above Ordnance Datum)			

The underlying geology of the Lower Lee catchment is basically a thick layer of London Clay (up to 70 metres deep in places). The clay is impermeable and contains virtually no groundwater. Below the London Clay lies a strata of Chalk. This strata is an important source of water (see Section 3.11), as the fissures in the rock hold large volumes of water which can be pumped out for public water supply. The London Clay protects the valuable Chalk aquifer from pollution caused by human activities on the surface (e.g. industry, waste disposal) which could seep through the ground.

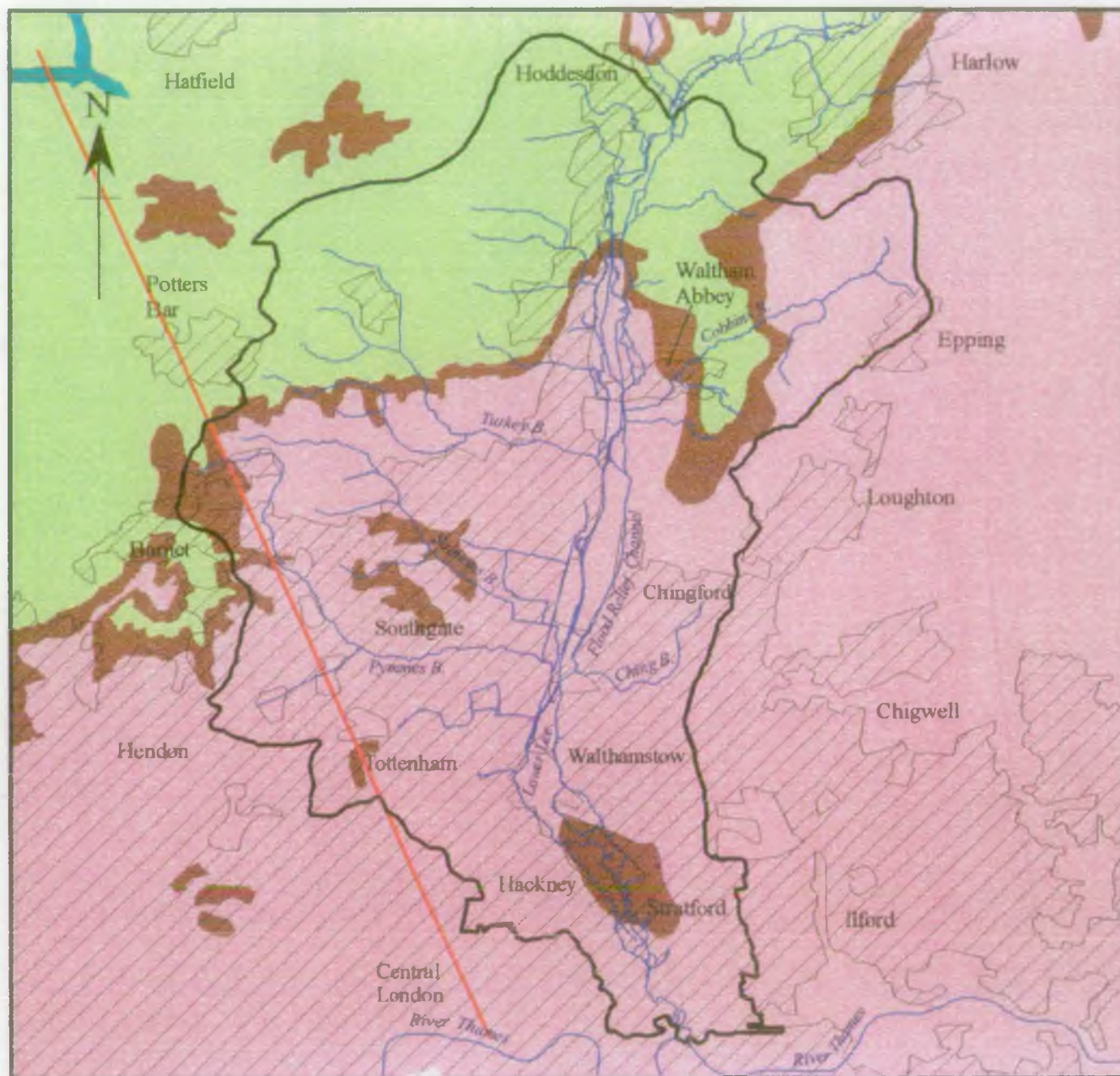
Nearer the surface there are deposits of river gravels and sands in the natural floodplains of the rivers, especially along the River Lee corridor. Additionally, there is a small 'window' in the London Clay, around Lea Bridge (Hackney), which exposes 'Woolwich and Reading beds'. These are clayey, fine grained sands which are generally in hydraulic continuity (i.e. directly linked) with the underlying Chalk.

In the northern parts of the catchment, north of the M25, there are also deposits of glacial gravels and boulder clay lying above the London Clay. Much of the gravel has been extracted for building use. The diagram below illustrates the general geological sequence of the catchment.



Soil type influences how rainfall runs off the catchment surface. Permeable soils such as chalky or sandy soils allow water to infiltrate through the ground. Clayey soils are less permeable and water tends to run off into ditches and streams or collect on the surface (waterlogging) rather than soak into the ground. Most of the Lower Lee catchment consists of clayey soils. Paved surfaces (e.g. roads, roofs) are impermeable and their construction increases the volume and rate of surface water run off. The combination of many paved surfaces and clay soils means that the local watercourses respond very rapidly to rainfall.

Soils can be eroded and deposited by rivers. On the outside edge of bends in a river water travels faster and can erode banks and on the inside of the bend, where flow is slower, silt and soil being carried along by the river can be deposited. These are natural processes of geomorphology (changes to the earth's surface) but present problems in certain locations, like urban areas where peoples' gardens become eroded and buildings or road bridges become undermined. A case in point is the Salmons Brook near Latymer Road, Edmonton. Here erosion was exacerbated by a gravel trap that had been installed in the 1980s. An improvement scheme was implemented in 1991/2 which has stabilised the area by constructing a number of small weirs and a river bank timber revetment system.



KEY

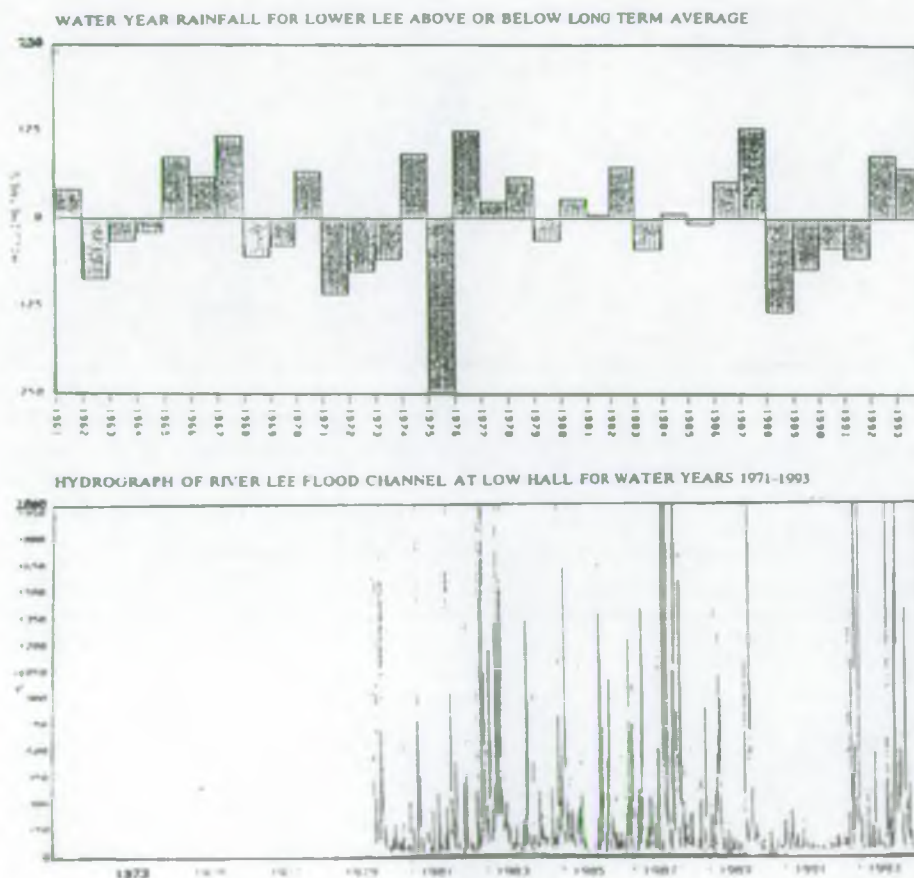
	Watercourse		Reading / Woolwich Beds		Middle Chalk		Geological Section
	Catchment Boundary		Upper Chalk		London Clay	<p>Scale (approx)</p> <p>0 5 km</p> <p>FILE REF: LLMAPCCT.PRE REV 3.4 (7/01)</p>	
	Urban area						

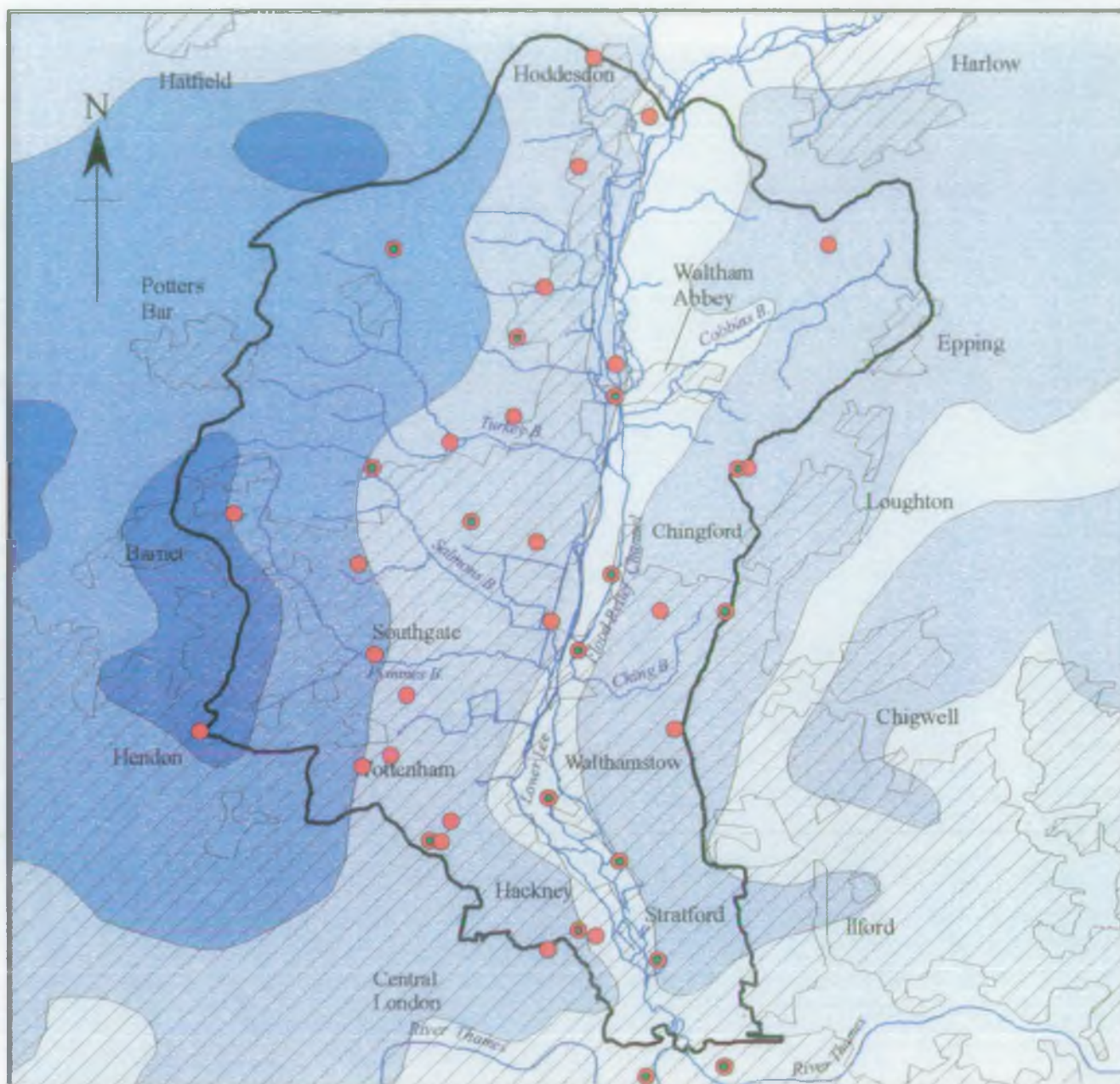
The Lower Lee catchment lies wholly on the London Clay and demonstrates the typically "flashy" nature of urban and clay run off rivers (see hydrographs below). The catchment area of the Lower Lee is some 380 km².

The river is gauged (i.e. the volumes of water flowing through are measured) at Feildes Weir (National Grid Reference (NGR) TL390092), Ordnance Road (TQ370988) and Lea Bridge (TQ351872). The river in this lower section is split into numerous channels and back-loops and has been further divided into the Lee Navigation and Flood Relief Channel. The Flood Relief Channel is gauged at Low Hall (TQ3566880). The main tributaries of the Lower Lee are Salmons Brook (gauged at TQ342937), Turkey Brook (gauged at TQ359985), Pymmes Brook (gauged at TQ340925) and Cobbins Brook (which has no permanent gauging station). Gauged flow information can be used in conjunction with rainfall data to give flood warnings during particularly wet weather.

Much of the fluvial or river gravels have been extracted in the Lee Valley and many of the workings now form lakes, some of which interconnect to the Flood Relief Channel. In addition to these old gravel pits, in the lower section there are several large reservoirs King George's, William Girling, Banbury, Lockwood and Warwick. The other main surface water feature of this area is the New River, which is an aqueduct dating from the 17th century which is still used to carry water to feed water supply reservoirs.

The other main addition to flows in the Lower Lee is sewage effluent and, in particular, discharges from Rye Meads and Deephams sewage treatment works. During dry weather, this water can make up the majority of flow in the River Lee.





KEY

	Watercourse	Annual Average Rainfall (mm)					Met Office Recognised Rainfall Gauges
	Catchment Boundary		Under 600		650 to 700		Daily Rainfall Gauges
	Urban area		600 to 650		Over 700	Scale (approx) 0 5 km <small>FILE REF: ULMAP001 PEX REV: 17/01/95</small>	

The ecology of streams and rivers reflects both the natural influences associated with the physical and chemical characteristics of the catchment from which they derive water and the artificial influences resulting from human activities.

Natural river channels may contain a range of environments such as fast flowing riffle areas, less turbulent glides or runs, and deeper pools. These may all occur within relatively short sections of river, particularly where a channel follows a sinuous course. The river bed sediments and aquatic plants present will often vary between these different habitats. The presence of contrasting riverine habitats in a section of watercourse promotes particularly high biological diversity. A variety of communities of aquatic invertebrates, fish and other river corridor wildlife, are naturally associated with these habitats. Ecological links with water-related bank side habitats are increasingly important in larger rivers where there is a natural tendency for river margins to merge into adjacent areas. Smaller, steeper rivers, like those draining the clay hills of this catchment, are likely to have restricted flora and fauna because of the severity of physical conditions.

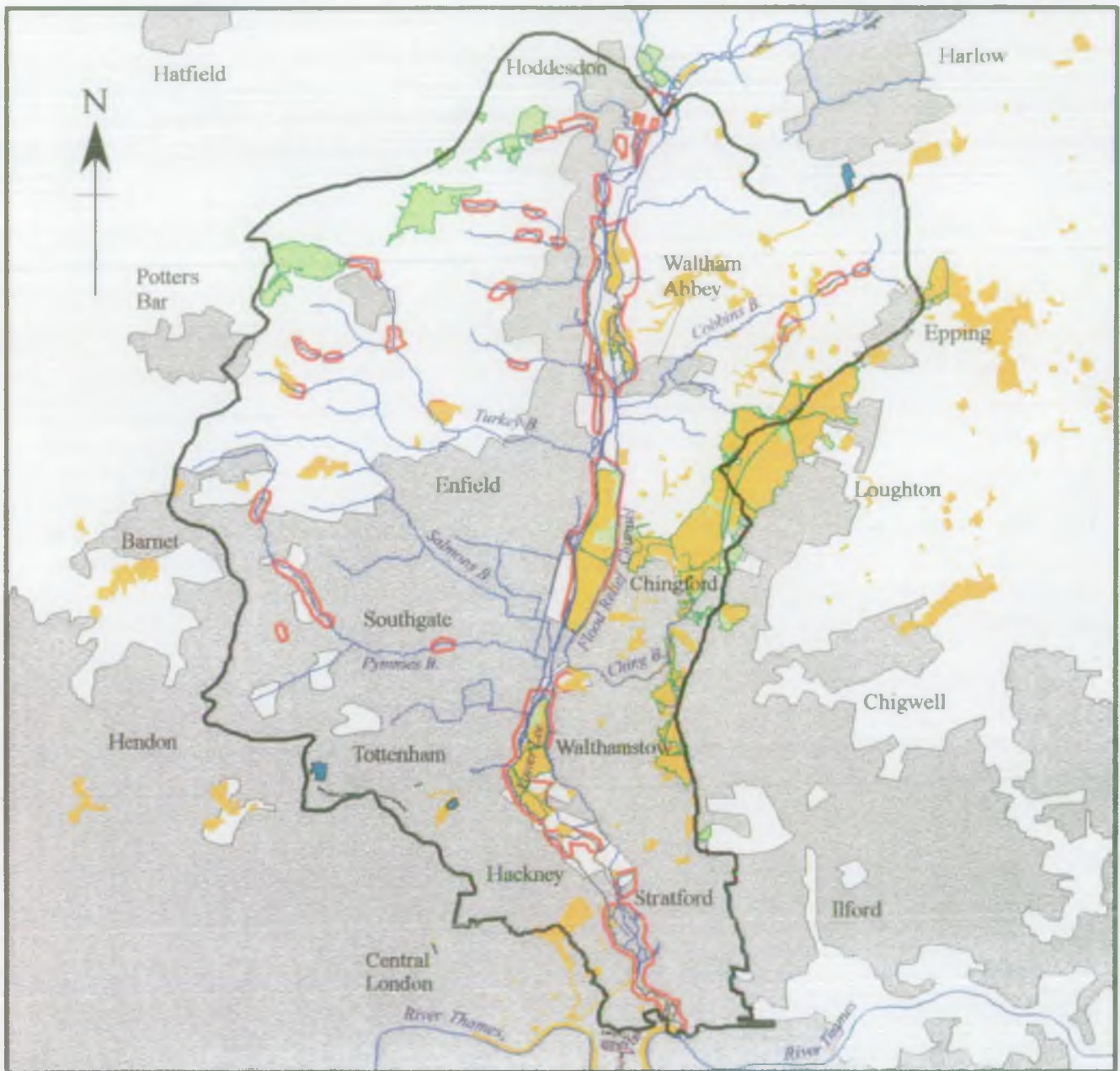
In the absence of significant human influences, the channels of the River Lee and its associated arteries in the Lee Valley floodplain, would support a rich variety of aquatic habitats. Traditionally, these floodplain areas supported a mosaic of land uses including cattle grazing, fishing and wildfowling with reed, sedge or willow grown for roofing, and other crafts.

Current Situation

The ecology of the catchment has been altered by a range of human activities associated with the progressive urbanisation of this area over the last 100 years. These changes, such as a loss of floodplain to urban development and increased rate of surface water run-off, have resulted in a high proportion of artificial channels with degraded in-stream, river margin and bank side habitats and reduced ecological value and potential.

Urbanisation has also had an influence on water quality. Increased use of rivers for sewage effluent disposal has been accompanied by increasing volumes of polluted urban run-off entering watercourses. The reduced time of travel within artificial channels and the loss of many natural river margin has also reduced the capacity of rivers and streams to self purify polluting loads. These water quality changes have also reduced the ecological value and potential of rivers.

There are a number of designated nature conservation areas within the catchment (see map opposite) and the Lee Valley is recognised as an internationally important north-south route for migratory birds. The long chain of rivers, reservoirs and associated wetlands provide areas for rest and feeding for birds. These areas are now recognised as a proposed Special Protection Area (pSPA) under the EC Birds Directive (79/409/EEC). The area of the pSPA is defined by the water based Sites of Special Scientific Interest (SSSI's) in the Lee Valley. SSSI's are designated by English Nature (EN), there are also several other SSSI's within the catchment that are not water based, for example, Epping Forest. They are all particularly important areas of habitat which have statutory protection. Additionally, there are other sites of importance for nature conservation which are designated by Local Authorities. These areas, are not as important as SSSI's but are nevertheless worthy of protection from damaging impacts and unsympathetic development. Urban streams often act as Green Chains, linking up other areas of open land within towns and cities. This role has been recognised in several of the Unitary Development Plans (UDP's), recently published by the London Boroughs. It is essential that



KEY

	Watercourse		Wetland Sites of Ecological Importance		Wildlife Protection Areas		
	Catchment Boundary		Local Nature Reserve		Sites of Importance for Nature Conservation		
	Urban area		Sites of Special Scientific Interest			<p>Scale (approx)</p> <p>0 5 km</p> <p>FILE REF: LLMAPC4.PILE REV.5 J 10/01/95</p>	

these streams are maintained and enhanced for their wildlife value, rather than becoming progressively more devoid of ecological value. Two of the key factors in restoring and sustaining the ecological value of these rivers within a predominantly urbanised catchment, are *firstly, keeping the river open, i.e. preventing further culverting and taking opportunities to open up existing culverts. Secondly, the successful promotion of riparian "buffer zones" for the conservation of bank side habitats. Such strips of land may offer benefits to recreation and amenity interests as well as nature conservation and pollution control.*

The designated Green Chains in the catchment include the Lee Valley, Ching Brook, Pymmes Brook, Salmons Brook, Turkey Brook, New River, Northern Outfall Sewer Embankment and Parkland Walk. Some of these are based on disused railway and other linear open spaces but they are generally applicable only in urban areas. *These links need to be protected and enhanced in order to sustain their ecological value.*

The southern most part of the River Lee, from Three Mills to the River Thames, is known as Bow Creek and is an important transitional area between the freshwater Lee and the tidal Thames and is likely to support unique habitats and species. *No significant data exists for this creek. The potential pressures of urban development on the creek, due to its position within the Thames Gateway, makes it essential that ecological information is obtained.* This will enable an assessment of the importance of this creek to estuarine fish and other biota and understanding of the complex ecology of the area to be more fully appreciated. There is currently a £1.2m project on Limmo Peninsula which will create an important wetland habitat in the heart of Docklands.

Future Situation

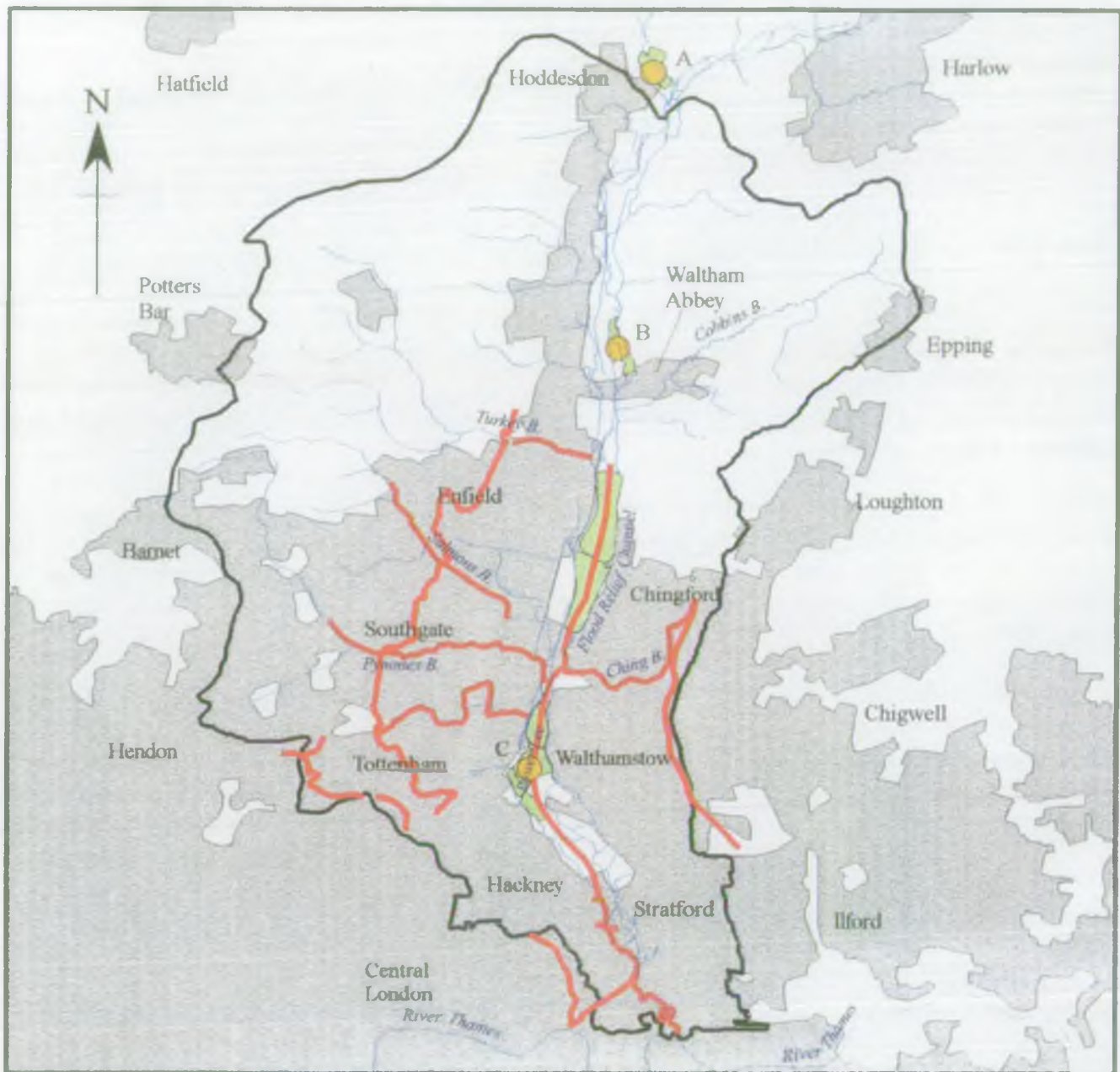
The decision whether to confirm the proposed SPA as permanent will be taken by the Department of the Environment (DoE). If designated, this will give much greater protection to the birds and their habitat. This protection may, however, involve restrictions in the use of parts of the Lee Valley of certain recreational activities, new building development and operation of water supply and sewerage infrastructure.

Three water related SSSI sites, Walthamstow Marshes, Cornmill Stream / Old River Lee at Waltham Abbey and Rye Meads, have been identified by EN and NRA as requiring research into the relationship between conservation value and water levels. *This means that they will each be investigated so that a Water Level Management Plan (WLMP) can be produced in order to ensure that the water regime is managed to protect and enhance the habitat. These areas are likely to be examined during the period 1996-1997.*







Modern day enhancement schemes and flood defence maintenance programmes incorporate a more sensitive approach to river channels. NRA Thames Region have produced "Flood Defence Guidance for Conservation in Watercourse Maintenance Works" (August 1994) for our own use and as a benchmark for external contractors.

A sustainable future for natural and semi-natural habitats needs the co-operation of the key parties that shape development. These include all the groups mentioned in Section 3.2, landowners and voluntary groups as well as the NRA.

It is also beginning to be recognised by several conservation bodies that natural features such as water meadows, ponds and natural river channels need to be created to replace those which have been lost over the past century, in order to redress the balance between built and natural environments.



KEY

	Watercourse		Green Chains		Water Level Management Plan Sites		
	Catchment Boundary		Proposed Special Protection Area (SPA)	A Rye Meads B Commill Stream / Old River Lee / RARDE Site C Walthamstow Marshes			
	Urban area					<div>Scale (approx)</div> <div>05 km</div> <div>FILE REF: LLMAPCC4 PRE REV 5.3 1/8/95/97</div>	

Fish populations are excellent indicators of the quality of the water environment. The European Community (EC) directive 78/659/EEC is used to classify the fisheries potential of rivers on the basis of the quality of the water. Rivers that support salmonid (e.g. trout) species are generally of a higher water quality than those that support cyprinid (e.g. roach) species. Cyprinid or coarse fisheries may include tidal as well as freshwater fish species.

Current Situation

River Lee Navigation - Feildes Weir to Bow Locks: A survey of the Navigation in 1993 found it to be a moderate quality coarse fishery. Upstream of Tottenham Lock, the Navigation is designated as a cyprinid water in accordance with EC directive 78/659/EEC. Below Tottenham Lock to Bow Lock, the confluence with the tidal River Lee, the Navigation no longer supports EC designated status. ***Periodic fish mortalities occur, either during or shortly after storm events, from Tottenham Lock downstream to Lea Bridge. The causes of this need to be investigated and remedial action considered.***

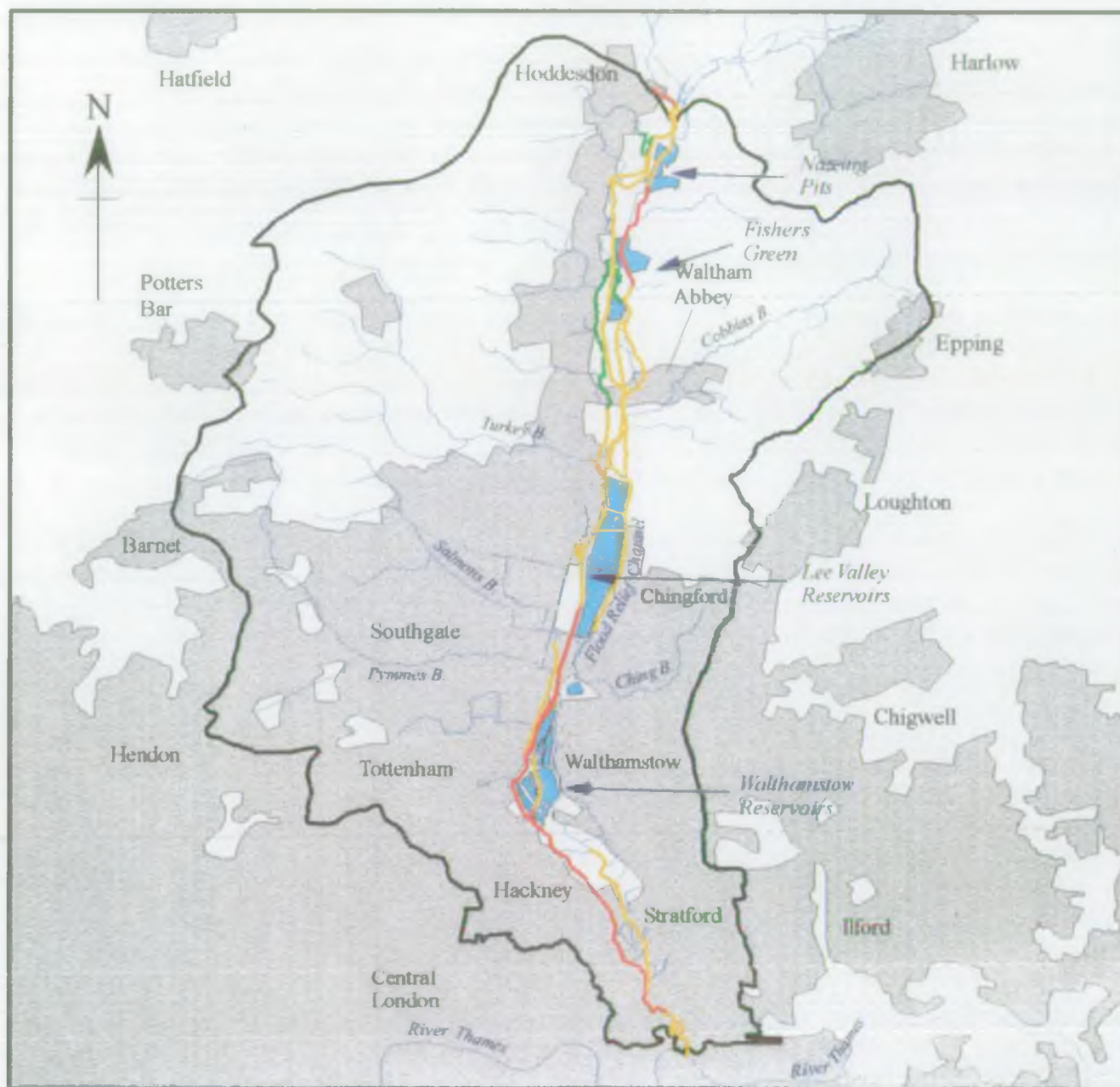
Fishery habitat on the Navigation is generally limited (e.g. lack of marginal habitat) influencing the fish populations found. Where good habitat or important features exist, either constructed or natural, improved fish communities are found. The survey of the system recorded a total of 19 different species with roach and pike being the dominant species. Good perch populations were also present.

A number of tributaries of the Navigation, such as the River Lynch, Broxbourne Mill Stream, Powdermill Cut, Small River Lee and Coppermill Stream, act as spawning and nursery areas for fish populations. Other lock and weir bypass channels at Dobbs, Carthagen and Kings weirs and the Flourmill loop at Ponders End, have been identified as good fish holding areas for species including chub, barbel, bream, tench, pike and carp. ***The water quality of the small watercourses is often not given formal protection through statutory standards.***

Angling on the Lee Navigation is controlled by the Lee Anglers Consortium. There are many still waters alongside the Navigation, the majority being old gravel pits. Angling is either controlled by a club or on a day ticket basis, providing both pleasure and specimen fishing. The King George V, William Girling and the Walthamstow complex of freshwater reservoirs also offer angling facilities.

Angling on the Lee Navigation and other notable watercourses such as the Flood Relief Channel, Cornmill Stream and old River Lee is often constricted at several locations throughout the year due to the growth of floating duck weed (Lemna sp.).

River Lee Flood Relief Channel: The Flood Relief Channel (FRC) starts at Feildes Weir and passes through a series of lagoons and gravel pits, which act as balancing lakes, then follows the Lee valley down to the River Thames. The FRC down to Holyfield weir has earth banks, a fairly natural appearance and receives a 'sweetening flow' from the Lee Navigation. It is not designated as a Cyprinid fishery under the EC directive. Species diversity is good with roach and perch being dominant and tench, eels, pike and dace present. The Nazeing lagoons are known to support large carp and pike along with roach, bream, tench and eels.



KEY

	Watercourse	Fishery Quality			Stillwater Fisheries	<p>Scale (approx)</p> <p>0 5 km</p> <p><small>PILA REF L1MAPCC3 PRE REV 5.3 1801 99</small></p>
	Catchment Boundary		Good			
	Urban area		Moderate			
			Poor			

The FRC from Holyfield weir to Tottenham Locks, including the section of the natural River Lee from Kings weir to below Holyfield weir is designated as an EC Cyprinid fishery. The latter section, which is faster flowing and quite natural, is one of the country's premier barbel fisheries.

Below Holyfield weir, there are several on-line sluice structures through Waltham Common. In-channel habitat favours multi-species utilisation, including barbel, tench, roach, perch, pike, bream and carp. Where the Old River Lee diverges towards Waltham Abbey to form the Cornmill Stream, problems of *low flow have caused degradation of the fishery habitat and a decline in the amenity value of these old water meadows.*

The Cobbins Brook feeds into the FRC downstream of Waltham Abbey and supports populations of coarse fish. However, survey data does not exist for this watercourse.

The channel profile of the FRC changes from semi-natural to man-made below Newmans sluices (just south of Waltham Abbey), with a gravel/silt base giving way to a solid concrete trapezoidal channel where it runs alongside the King George and William Girling reservoirs.

This deeper impounded section supports larger specimens such as bream, pike, barbel and tench along with chub, eel and roach. Despite the impoverished habitat adjacent to the reservoirs, barbel and dace were noted as present. It is not known whether the population is self-sustaining or supplemented by fish that are washed down the FRC from the Small Arms loop during flood events.

Water is abstracted from the FRC at Chingford for public supply and pumped to the adjacent reservoir, leaving the downstream channels with low flows for prolonged periods.

At Green Gates (Lee Valley Trading Estate, Edmonton) the New Cut diverges and returns water to the Lee Navigation at Tottenham Lock via the East and West Cuts. Tench and eels predominate with roach, chub and perch present in a semi-natural habitat flanked by the Lee Navigation on one side and the Walthamstow reservoir complex on the other.

Tidal River Lee: Diverging from the Lee Navigation at Lee bridge weir, the lower tidal river runs through the industrialised areas of Hackney, Stratford and Bow and is of fair-good water quality but has no EC designation. At Hackney Marshes the channel is very wide with a semi natural aspect. In-stream habitat is good with alternating riffle/pool sequences. Species composition consists of roach, eel, perch, dace, bream, pike and tench with evidence of recruitment. This is the only location where general access to the river bank is permissible therefore angling is only possible at this point.

The presence of flounder at Stratford indicates tidal influence at this location. Despite high sheet piled walls, fisheries habitat was considered good with varying pools and riffles and a good gravel substrate supporting instream plant growth. At this point and at Three Mills, eel and flounder were present along with dace and sticklebacks.

Near Bow Lock a large bed of *Phragmites* sp. offers natural habitat on one bank. At Bromley dock and Bow Creek, eels were the dominant species with estuarine species such as flounder, mullet and smelt present.

Still Waters: The catchment has many still waters in the form of lakes, reservoirs, ponds and pits. These provide angling on either a club membership or ticket basis. Lee Valley gravel pits are well known for their specimen tench, bream, carp and pike fishing and attract anglers from well outside the catchment.

Thames Water Utilities Ltd (TWUL) manage a number of their reservoirs for angling. The King George Reservoirs are coarse fisheries and can be fished from the bank by season ticket with catches of carp to 18 lbs. and pike to 25 lbs. recorded. Walthamstow Reservoirs 1, 2 and 3, West Warwick, High and Low Maynard and Lockwood Reservoirs are also coarse fisheries, with catches of carp to 34 lbs, pike to 29 lbs pike, bream to 13 lbs with other species such as perch, roach, barbel, chub and dace present. Day and season tickets are available which cover all these reservoirs (except Lockwood and West Warwick).

Future Situation

The NRA will continue to monitor fisheries using surveys. The feasibility of surveying the Cornmill Stream, Old River Lee, Pymmes Brook and Salmons Brook will be examined.

Emergencies will continue to receive a high priority (response within 2 hours during workings hours and 4 hours outside these times). NRA staff attend incidents such as pollution events and water loss to rescue or transfer fish to safe areas or, where necessary, to install aeration equipment to keep fish alive which cannot be moved.

The NRA at a national level is investigating the issue of Cormorants, their impact upon fish populations and what can be done if they are proved to be a significant problem. In the Lower Lee catchment, the Walthamstow Reservoirs are known to be one area where cormorants are a concern.

There are currently many barriers to fish movements including locks, weirs and culverts. Opportunities for promoting movement by installing fish passes will be examined over future years with a view in the long term to enable migratory species to pass through the catchment to upper reaches of the River Lee and its tributaries.

Opportunities will be taken to create and improve refuges where fish can shelter, during pollution events, whilst polluted water passes by.

Landscape can contribute greatly to the amenity of an area. In urban areas, natural landscape is particularly valuable. Heritage encompasses the elements of our history which still survive including examples of buildings and structures which date back to the industrial revolution and archaeological remains from further back in history.

Current Situation

Throughout the catchment, both within and outside Greater London, there are areas of valued landscapes. These are recognised by local planning authorities and are shown on the map opposite. It should be noted that in the Epping Forest District, landscape protection is district wide and not considered for specific areas.

It has also been recognised in the Lee Valley Park Plan 1986 that parts of the Lee valley are in need of landscape improvement. This has been brought about primarily because of previous gravel workings and derelict areas of glasshouses. Although this is not picked up in the statutory designations shown opposite, Lee Valley Regional Park is actively working towards landscape improvements within the park. The NRA will continue to support LVRPA in their work to improve the landscape of the Lee Valley.

Within London there are several lines of protected views, for example the view of St. Pauls from Alexandra Palace. River corridors within London provide some of the main breaks from urban landscapes. The Lee Valley is particularly valuable in this respect and many of its tributaries such as Pymmes Brook, Salmons Brook and The Ching, are the backbone of urban open spaces. The NRA has also undertaken some landscape analysis in the catchment (see Section 4.3). *Existing areas of importance need to be protected, particularly green chains in the urban areas.*

The catchment is a very rich heritage area. It has a history of settlement and human activity dating back to palaeolithic times around the early part of the stone age, particularly along the River Lee itself, and there are many areas designated as being archaeologically important (see map opposite).

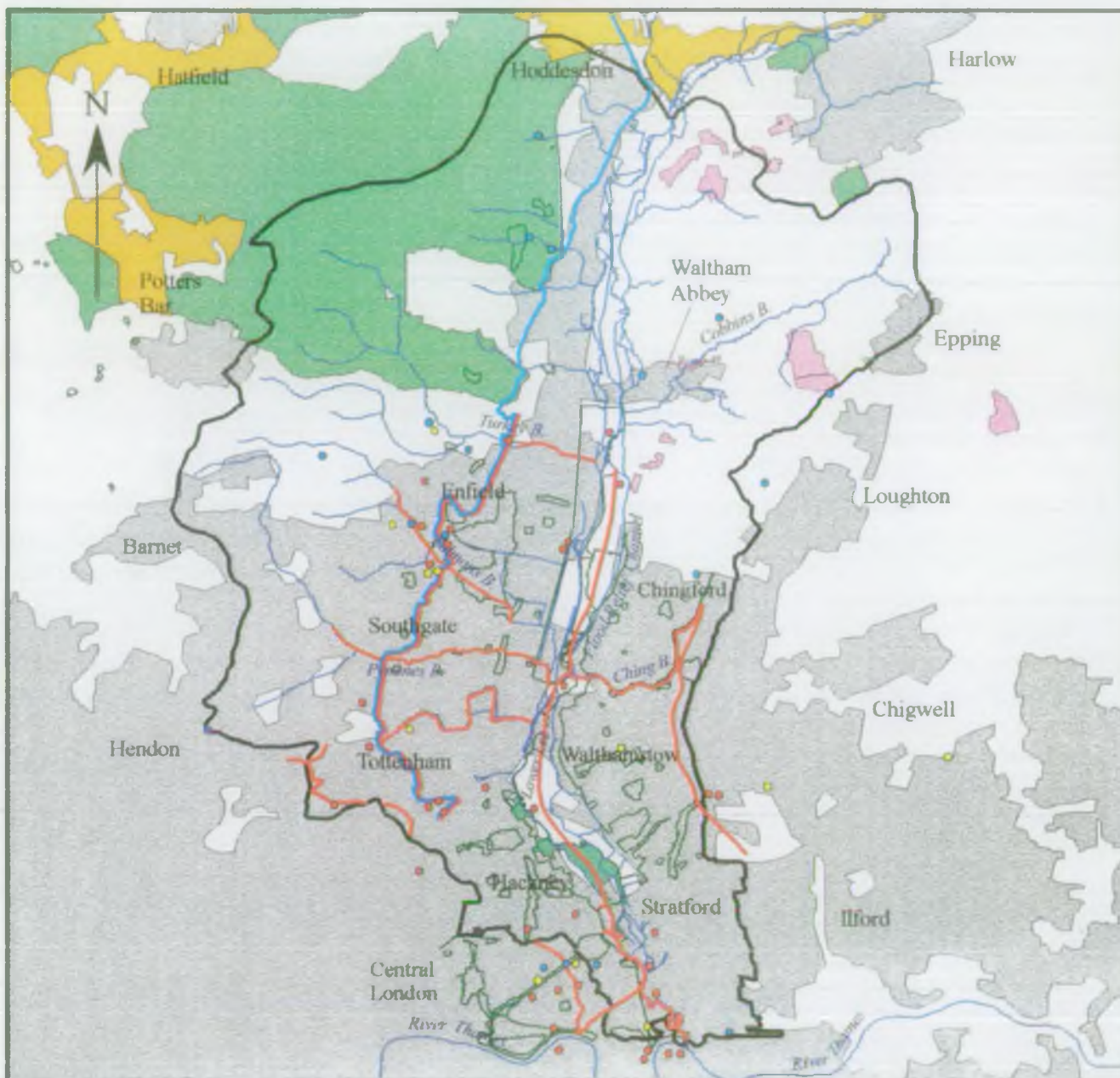
Listed buildings, scheduled ancient monuments and existing water related archaeological sites of the catchment are also shown on the map opposite. Of note are the tidal mills on Three Mills Lane (as depicted on the front cover), the castle at Stoke Newington Reservoir, the Monkfield Beam Engine, Tottenham, and the many lock keepers' houses along the River Lee Navigation. The New River is also a notable structure, being first constructed in the 17th century to supply drinking water to London (see Section 4.2)

There is concern that a number of potential archaeological sites may be drying out particularly along the Lee Valley. As a result of this, further investigation and monitoring may need to be undertaken to ascertain the extent of the drying out and any resultant actions to combat this.

Future Situation

New developments will continue to be controlled by local planning authorities who should ensure that they will be sustainable by respecting and enhancing the landscape and preserving our heritage.

It is hoped that a heritage strategy for the Lee Valley will be compiled by the relevant statutory archaeological authorities.



KEY

	Watercourse		Landscape Development Areas		Areas of Archaeological Importance & Interest		Green Chains
	Catchment Boundary		Historic Parks and Gardens		Scheduled Ancient Monuments		The New River
	Urban area		Landscape Conservation Areas and Areas of Great Landscape Value		Listed Buildings (water related)	<p>Scale (approx)</p> <p>0 5 km</p> <p>FILE REF LLMAPCC4.PLE REV 5.3 10/01/95</p>	
					Archaeological remains (still standing)		

Rivers have long been utilised as a method of transport whether it be for pleasure or commercial purposes. Indeed, on the River Lee there is a Common Law public right of navigation. Canals have been constructed and rivers regulated specifically for this purpose.

Current Situation

British Waterways (BW) is responsible for navigation in the Lower Lee catchment apart from the section of the tidal River Lee downstream of the A13 where the Port of London Authority are responsible (see map opposite). There are 47 km of waterway classified as navigable (under the 1968 Transport Act) within the catchment. This Act divides navigable waterways into three categories.

Commercial Waterways
Cruising Waterways
Remainder Waterways

The Lee Navigation and Limehouse Cut.
The Hertford Union Canal.
The Bow Back Rivers.

BW manage remainder waterways as economically as possible but can develop or dispose of them as cases dictate. BW have a duty to maintain and provide services and facilities on both commercial and cruising waterways. Since the 1968 Act, commercial traffic has dropped further and the majority of boats are now purely recreational.

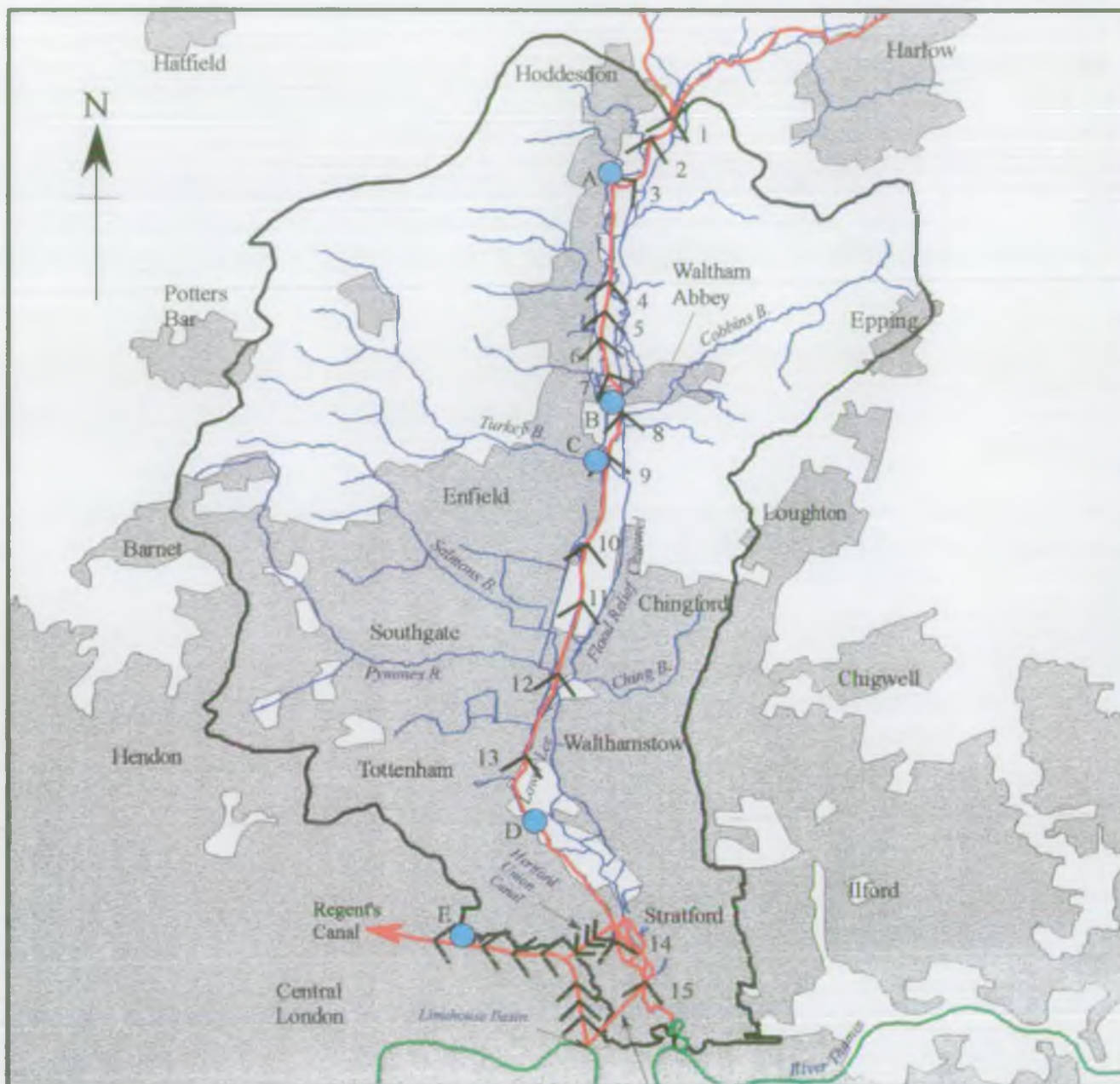
The River Lee was used for navigation in Roman times and has been successively improved since, with significant improvements during the late 18th and early 19th centuries as the nation's canal network was constructed. Canals seated in the Lower Lee catchment are the Hertford Union Canal which links the Lee Navigation at Hackney to the Regents Canal and Grand Union Canal, and the Limehouse Cut, which connects the Lee Navigation at Bow Locks to Limehouse Basin providing an alternative route to the River Thames.

The River Lee Navigation has 15 locks over its 34 km length from the River Thames to Feildes Weir. By continuing north Ware and Hertford can be reached by staying on the Lee Navigation, whilst the towns of Harlow and Bishop's Stortford can be reached by turning east on to the Stort Navigation.







Facilities for boating can be found at: Springfield Marina, Hackney; Hazelmere Marina, Waltham Abbey; and the Lee Valley Marina, Broxbourne. The river is also used by canoe clubs, rowing clubs, river cruisers and disabled clubs. Navigation users have experienced problems with excessive plant growth in some parts of the Lee Navigation. ***Duck weed and blanket weed can clog up engine intakes on motorised vessels and entangle paddles of canoes and rowing boats.***

Lee Valley Regional Park Authority operate a fleet of narrow boats for river trips and day boats for hire on the River Lee during summer months. These are based at Lee Valley Marina and Springfield Marina and run at full capacity during peak times.

Residential boats have caused problems in some locations with discharges of raw sewage and other waste products including motor oils. Where boats are to be moored for residential purposes, it is clearly desirable to equip them with proper services.



KEY *Limehouse Cut*

	Watercourse		Navigable river/canal (BW)		Navigable river (PLA)	BOATYARDS : A. Lea Valley Marina B. Hazelmere Marina C. British Waterways, Enfield Lock Yard D. Springfield Marina E. Laburnam Boat Club
	Catchment Boundary	LOCKS : 1. Feilde's Weir Lock 2. Dobbs Weir Lock 3. Carthegena Lock 4. Aqueduct Lock 5. Cheshunt Lock 6. Waltham Common Lock 7. Waltham Lock 8. Ramney Marsh Lock 9. Enfield Lock 10. Ponders End Lock 11. Picketts Lock 12. Stonebridge Lock 13. Tottenham Lock 14. Old Ford Locks 15. Bow Locks U. Un-Named Locks				
	Urban area					<div><div>0</div><div>Scale (approx)</div><div>5 km</div></div> <div>PR 2 027 LEA/CCT PREP REV 5.3 18/01/95</div>
	Boatyards					
	Locks					

Future Situation

Since 1989 BW have promoted the Lee and Stort Navigation to increase recreation including walking, cycling and the promotion of wildlife and heritage issues. This includes policies for increasing the number of moorings available. Any such proposals need to be carefully considered in light of their environmental impacts, effects on other users and navigational restrictions such as the width of the channel. Opportunities for marinas off line of the Navigation could be examined in this context as they generally have less impacts. *A strategic view of areas which are and are not suitable for additional moorings should be taken with BW, LVRPA, NRA and Local Authorities being involved.*

The move toward sustainable development and the increase in road traffic could open up possibilities of increasing the use of waterways for commercial traffic in future years including the provision of river bus services. *Investigation is needed into the potential impacts and benefits this could bring.*

In many areas, particularly the southern part of the catchment, councils and local groups are seeking to promote greater use of riverside paths and towpaths as a recreational resource. This is particularly likely in areas that are deficient in accessible public open space.

There may, in the longer term, be opportunities for re-opening some stretches of river for navigation. For example, the Powder Mill Cut could allow access into the proposed Gunpowder Museum at Waltham Abbey. Another potential area for increasing the length of navigable river would be to re-open parts of the Bow Back Rivers in the south of the catchment. Some work has already been done on dredging the Bow Back Rivers but more and regular work is likely to be required to keep all the channels open. *Any such initiatives would require extensive feasibility studies.*

Leisure time is an important part of everyone's life. The water environment can offer amenity and recreation opportunities both in terms of set activities such as sailing or fishing and in terms of informal activities such as walking.

Current Situation

Water based amenity and recreation within the catchment focuses on the Lee Valley Regional Park which embraces a string of lakes, reservoirs and the River Lee Navigation and other parallel channels of the River Lee. This area straddles the county boundaries of Hertfordshire and Essex and extends further down the catchment into Greater London. Recreational provision is coordinated by the Lee Valley Regional Park Authority (LVRPA) who own around one third of the Park. It is recognised as a recreational asset of regional significance.

One of the aims of the LVRPA is to increase access to and within the park by foot, bicycle, horse, car and public transport. This includes current improvements to the Lee Navigation towpath, including the provision of seats and clear signposts. The aim is to establish a physical link to unite the different sections of the Park. To this end the Lee Valley Trail has been established along the length of the River Lee from Luton to London. The Park also links into a network of other walks in and around London (see map opposite). Many people who use the Park do so informally for walking, picnicking or exercising dogs.

Angling and boating activities are covered more fully in Sections 3.7 and 3.9 respectively.

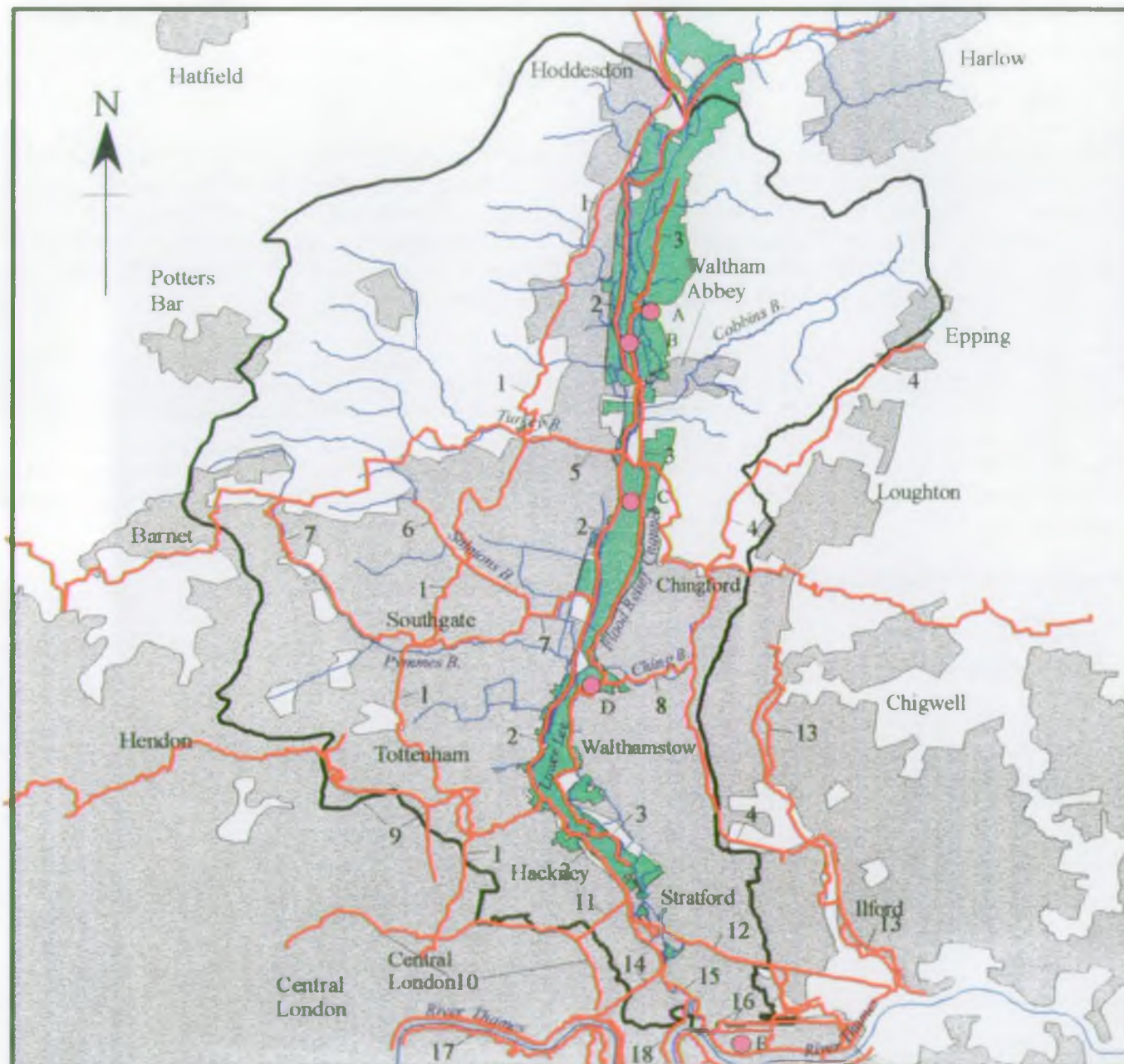
Thames Water Utilities Ltd (TWUL) operate Walthamstow No. 4 and 5 reservoirs and East Warwick as game fisheries and access is available with a day ticket.

Sailing and windsurfing are also popular on several water bodies within the Park including Nazeing Lakes, Holyfield Lake, King George Reservoirs and Banbury Reservoir. There are opportunities for boat owners and those wishing to hire vessels and partake in races. On Banbury Reservoir the Lee Valley Water Sports Centre offers courses in sailing, windsurfing, water skiing and power boating. There are also facilities and events for the disabled, youth groups and schools on Banbury Reservoir. Outside London, Cheshunt Lake is used extensively by youth organisations participating in water sports.

Canoeing is also a popular activity in the Park with particular emphasis on white water runs downstream of weirs on the River Lee. LVRPA are currently examining options for additional sites which could be utilised for this.

There are also opportunities for bird watching at King George V reservoirs, the Walthamstow Group of Reservoirs and at the RSPB Rye House Marsh Reserve which is just north of the catchment boundary in Hoddesdon. Common Terns, Kingfishers, Herons, Tufted Duck, Goose, Goldeneye, Black necked Grebe and a wide selection of Waders all frequently visit these sites as well as rarities like the Grey Phalarope, Sabines Gull and Little Egret

Outside the LVRPA area of the catchment, the water environment still provides a valuable recreational resource. Lakes and ponds are common features of many parks and gardens, and are often the most accessible areas of open water for many residents of this catchment. They can act as important areas for informal recreation, just to sit beside, walk around or even feed the ducks.



KEY

	Watercourse		Water Recreation Sites		Footpaths and Riverside Walks
	Catchment Boundary	A. Fishers Green B. Cheshunt Lake C. King George's Reservoir D. Banbury Reservoir E. Royal Docks			1. New River Walk 2. Lea Valley Walk 3. Lee Valley Park Path 4. Centenary Walk 5. Turkey Brook 6. Salmons Brook 7. Pymmes Brook Trail 8. Ching Way 9. Parkland Walk
	Urban area				10. Regents Canal Towpath 11. Hertford Union Canal Towpath 12. Greenway 13. Roding Valley Routes 14. Limehouse Cut 15. River Lee / Bow Creek Towpath 16. Royal Docks Links 17. Thames Path 18. Isle of Dogs Riverside Walk
	Lee Valley Park				

FILE REF: LLMARCA/PRE REV3 J 18/01/95

Current Situation (Continued)

Responsibility for the maintenance of such lakes in public areas usually lies with the Local Authority. The long term health of such features must be kept under review.

The catchment has also been host to a number of water based events over recent years. Waltham Abbey hosted the National Waterways Festival in 1989 and 1994. The Broxbourne Water Festival is held every summer, and last summer the Limehouse Festival celebrated the reopening of the Limehouse Marina on the edge of the Lower Lee catchment in East London. This is intended to become an annual event.

Future Situation

The Eastern Council for Sport and Recreation (ECSR) believe that many of the currently available facilities for formal water-based recreation have reached full capacity in terms of both levels of use and membership. *There is therefore a need to create new opportunities for water recreation in the area, particularly as the Lee Valley Regional Park is designed to serve the needs of a much larger catchment population than is presently possible.*

LVRPA believe that the pattern of using former gravel pits is likely to continue and are investigating the feasibility of using the extensive mineral extraction site at Glen Faba near the northern catchment boundary. The site is still being worked at its southern end and will not be fully available until the end of the decade, although recreational uses could be introduced to parts of the site on a phased basis. The ECSR believe that a full range of water sports could be accommodated on a series of lakes, the largest being about 40 hectares which constitutes one of the few remaining opportunities to develop water sports in the catchment. As the River Lee is suitable for canoe touring, the LVRPA also proposes to develop a campsite for canoe tourists here.

The development of a 2000 m international rowing course at the Victoria and Albert Docks on the southern fringe of the catchment has been proposed, as has a 150 m canoe slalom course downstream from Dobbs Weir on the River Lee. The City Challenge project in the Stratford area includes plans for a waterside museum and tourism development at Three Mills.

Whilst amenity use of the water bodies within the Lee Valley is restricted in places by both poor water quality and the desire to minimise disturbance to breeding birds, the increased use of time and space zoning could help alleviate some of the problems of 'overcrowding'.

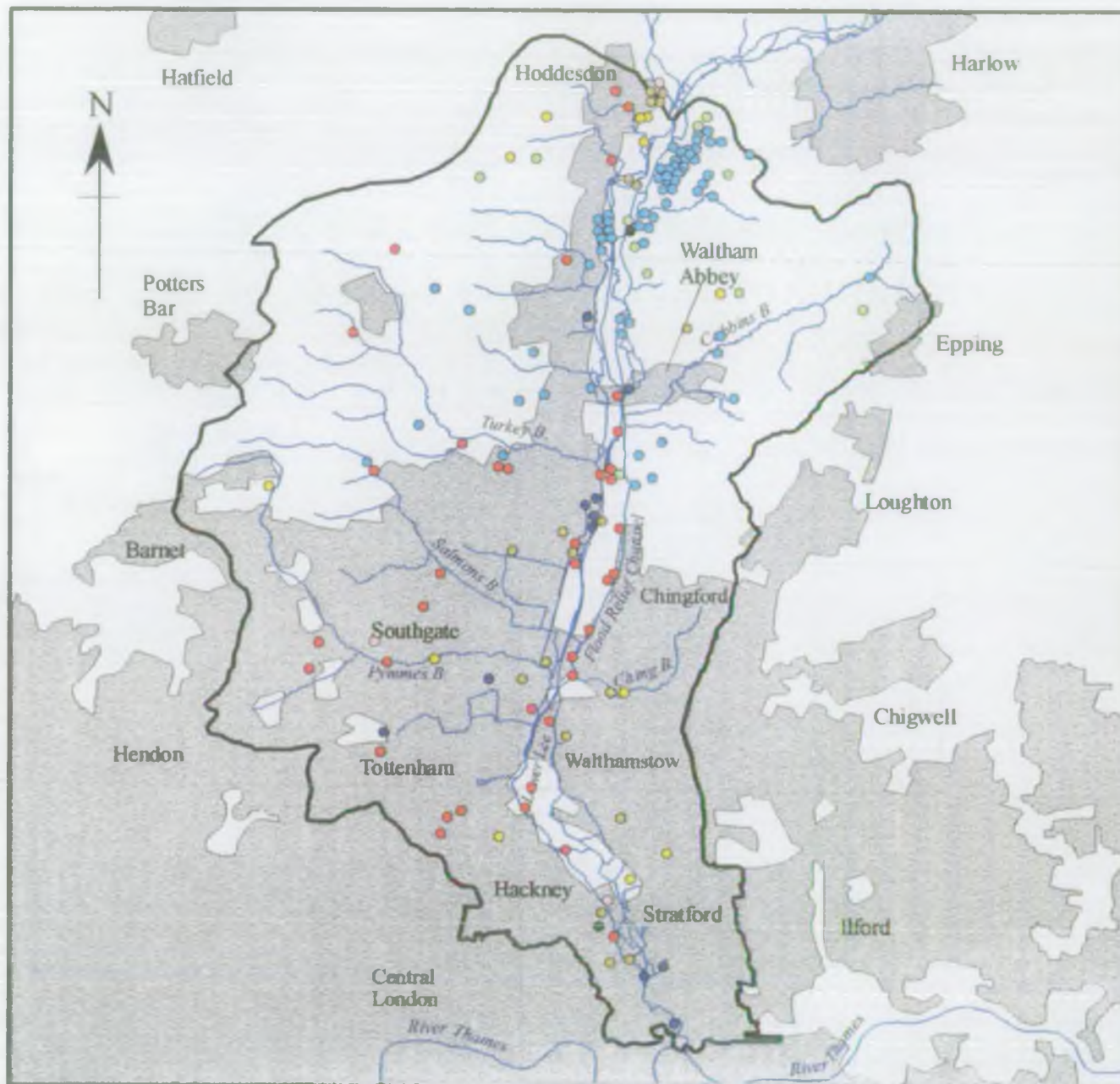
Water is abstracted (removed) from rivers and groundwater to provide for the needs of agriculture, industry and public supply. Abstractions are controlled by a system of licences introduced in the 1960s and now administered by the NRA. Licences restrict the amount of water which may be taken and can include further conditions to provide enhanced environmental protection. Some small abstractions (e.g. to supply a single household) do not require a licence.

Abstractions can vary in quantity from the very small amounts needed from a garden well to supply a single household, to the large quantities needed, for public water supplies. In the Lower Lee catchment licences for public water supply abstractions account for 97% of the total volume of licensed abstraction. Of this 97%, 74% is from the Thames Water abstractions at Chingford/Enfield. Surface waters provide the main resource for abstraction (72% of the total volume abstracted).

There are currently 140 licences in force within the plan area. These are summarised as follows:

TABLE 5: DISTRIBUTION OF WATER ABSTRACTION LICENCES

Purpose	No. licences	Total Authorised Volume (Ml/year)
Public Water Supply	15	271,614
Private Water Supply	10	1,030
Agriculture (inc. horticulture)	66	796
Industry/Minerals	20	2,527
Transfer	2	134
Spray Irrigation (agriculture)	10	130
Spray Irrigation (non agriculture)	4	83
Power Generation Cooling	1	1,750
Cooling	12	1,908
Total All Purpose	140	279,972



KEY

	Watercourse	LICENSED ABSTRACTIONS					CEGB (Cooling)
	Catchment Boundary		Public Water Supply		Industrial and Mineral Washing		Cooling
	Urban area		Private Water Supply		Water Transfer		
			Agricultural		Spray Irrigation / Agricultural	Scale (approx) 0 5 km <small>FILE REF LLMAPCC3.PLF REV 1 11/01/94</small>	
			Corporation / Authority Use		Spray Irrigation Non - Agricultural		

Effluent is the treated waste water from sewage treatment works or industry which is discharged in a receiving water body. All such discharges in the catchment are controlled by means of either NRA consents or Her Majesty's Inspectorate of Pollution (HMIP) authorisations. Consents and authorisations are legal documents issued by the regulator which impose conditions on the quantity and quality of a discharge in order to protect the environment. The regulator has powers to monitor the consents and if the conditions are not being met, to take action to ensure compliance.

Current Situation

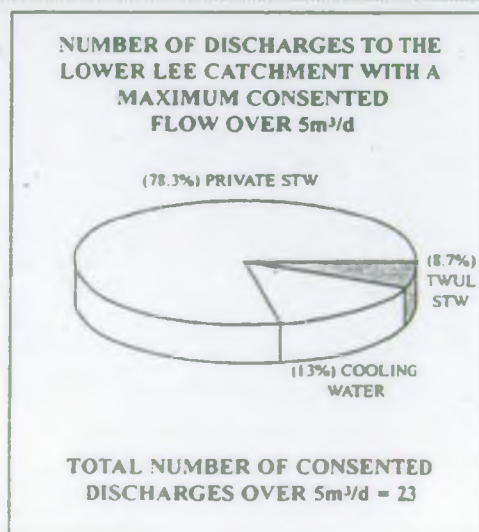
There are 103 consented discharges into the Lower Lee catchment, 23 of which have a maximum consented volume of $>5 \text{ m}^3/\text{d}$. The majority of these effluents are from private sewage treatment works (see diagram below). The largest discharges by volume are those from the two Thames Water Utilities Limited (TWUL) sewage treatment works, Rye Meads and Deephams which together comprise 99.5% of the volume. The location of these works is given on the map opposite and their importance is shown in the table below. There are three HMIP authorised discharges from prescribed processes to the rivers of the Lower Lee catchment. These are Powergen PLC, Hoddesdon; Delta Enfield Metals, Enfield; and North London Waste Authority, Edmonton.

TABLE 6: SEWAGE TREATMENT WORKS' DISCHARGES

	Discharge m^3/day		% of River Lee flow (approximately)		
	Maximum Consent	Usual dry weather	Dry weather	Average	Peak Flows
Rye Meads	330 000 m^3/d	110 000 m^3/d	65-70	25-40	8-15
Deephams	600 000 m^3/d	200 000 m^3/d	75+	40-50	15-20

Future Situation

The NRA have identified the need to make changes to the consent and the treatment plant at Rye Meads sewage treatment works in order to meet the needs of the EC Fish Directive in the River Lee and to provide better protection for the aquatic environment. The proposed changes have been included in the TWUL Asset Management Plan (AMP2) recently approved by the Office of Water Services (OFWAT). *Discussions between the NRA and TWUL are in progress to agree priorities for improvements at sewage treatment works on a Region-wide basis.*





KEY

	Watercourse		Sewage Treatment Works Location		HMIP Consents		
	Catchment Boundary		1. Rye Meads 2. Deephams	A	PowerGen		
	Urban area			B	Delta Metals, Enfield		
				C	North London Waste Authority		
						<p>Scale (approx)</p> <p>0 5 km</p> <p>FILE REF: LLMAPCCT PRE REV 5.3 17/01/95</p>	

How land is used greatly influences the water environment. Where land use is urban, the quality and quantity of surface run off can be detrimentally influenced. Rural land use in the area tends to be recreational or agricultural and run off tends to follow a more natural course but still be influenced chemically. Good land management is therefore vital for maintaining and improving the water environment.

URBAN DEVELOPMENT

Current Situation

The catchment is characterized by extensive urban development both within the Greater London area and northwards along the Lee Valley corridor.

This pattern of development reflects the growth of London over the past 100 or more years. Older development during the 19th and early 20th centuries is concentrated closer to central London and around centres like Enfield, Tottenham, Waltham Abbey and Hoddesdon, which would have been outlying towns at that time.

With improvements to the transport system, roads, railways and the London Underground in particular, the suburban expansion of London accelerated during the inter-war years and many of the previously outlying towns and villages merged into one large conurbation.

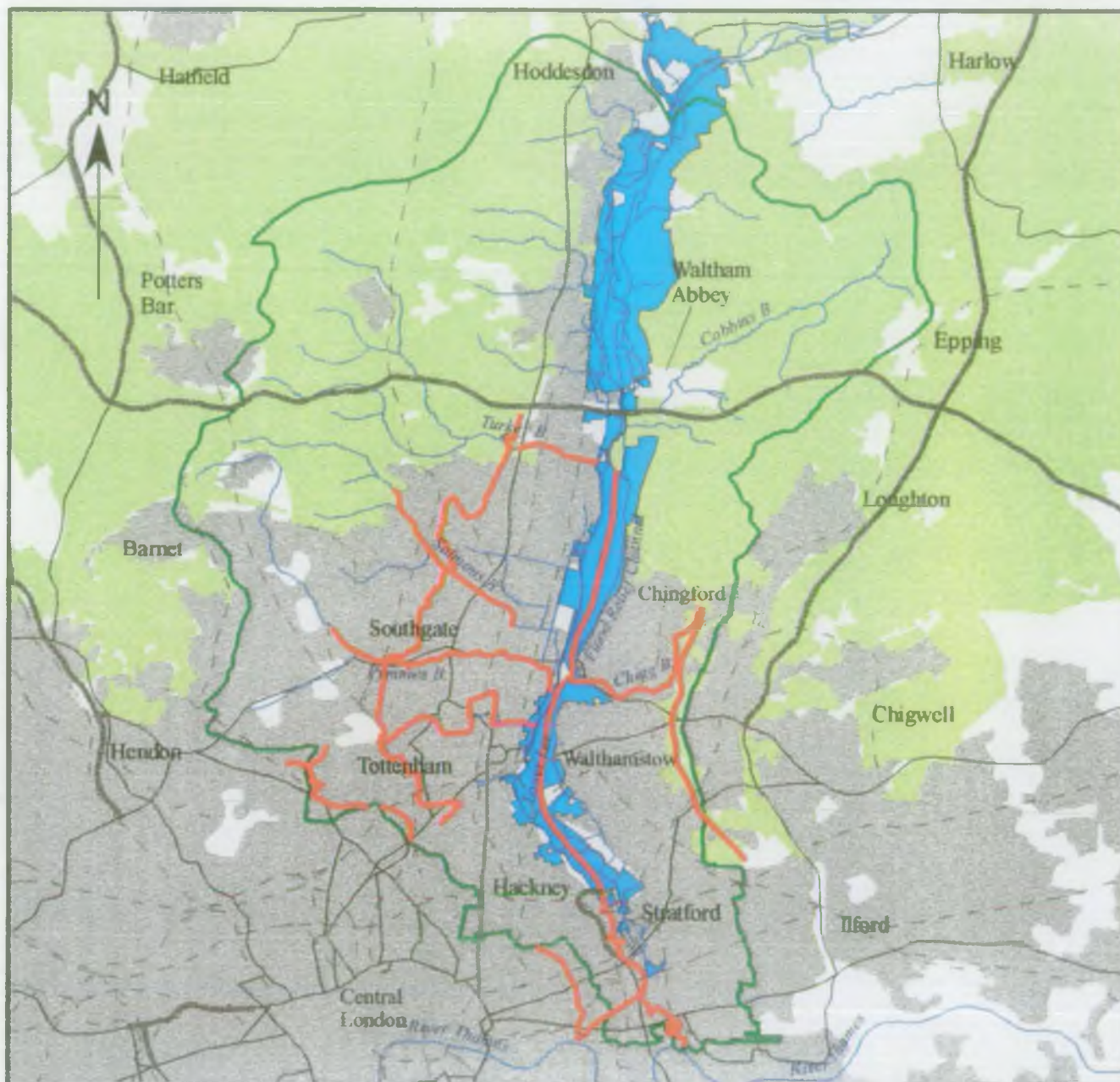
This suburban sprawl was the major factor leading to the creation of Metropolitan Green Belt policy. As the map opposite shows, the vast majority of land which is not already urban, is designated Green Belt. Recent development has therefore been largely constrained within, or adjacent to, existing urban areas.

Some of the older Victorian and Edwardian industrial, commercial and residential areas in the Lower Lee Valley, such as Stratford and Docklands, have become run down and often derelict. Additionally some areas of high density post-war housing estates are in a poor state of repair. Many of these areas seem ripe for redevelopment at some stage in the future. There has already been large scale redevelopment of Docklands, including Canary Wharf, led by the London Docklands Development Corporation.

Future situation

With the exception of some releases of Green Belt land, such as the 22 hectares for just under 1000 new houses west of Cheshunt, future development is likely to be infilling and redevelopment of existing urban areas.

This is currently being prompted by a number of regeneration initiatives. The largest of these is the European "Objective 2" status of parts of the Lee Valley south of the M25. This will make £50m available over three years for projects that include the provision of both tourism facilities and hi-tech premises, and also retraining schemes for the unemployed. A similar sum may be allocated for further redevelopment and infrastructure improvement beyond this period.



KEY

	Watercourse		Motorway		Green Chams		
	Catchment Boundary		Primary 'A' Road		Lee Valley Regional Park		
	Urban area		Railway			<p>Scale (approx)</p> <p>0 5 km</p> <p>FILE REF: LLMAP00 PRE REV 5 11/01/91</p>	
			Green Belt				

URBAN DEVELOPMENT

Future situation (continued)

A bid has also been made for European LIFE funds. This applies to the southern most part of the catchment and is based on the concept of sustainable tourist development in East London. This bid is still being considered at this stage.

There are two City Challenge schemes currently in operation. These are at Stratford and Dalston. The southern part of the catchment is within the Thames Gateway (previously known as the East Thames corridor), a central government strategy to boost the profile and economy of east London, south Essex and north Kent.

The London Borough of Waltham Forest has placed a bid for Single Regeneration Bid (SRB) funding in the Leyton area. This is a fund made available to improve the local environment and the quality of social and economic life by encouraging local partners to plan a strategic approach to needs and priorities of the area.

Transport development is the key to many of the regeneration projects. These include the following rail projects:

Jubilee Line Extension to Stratford
East London Line extension to Dalston
Channel Tunnel Rail Link - including a possible International station at Stratford.
Hackney to Chelsea Line

and the following road projects:

Hackney - M11 link road
M25 widening
A10 widening north of the M25
possible east London river crossing
Lower Lee Crossing and Limehouse Tunnel (already built)

There are also three Ministry of Defence sites in the Waltham Abbey area which are subject to redevelopment pressures. These sites form large parcels of land and could be redeveloped in the medium term. They could be expected to be mixed developments of housing, industrial/business use, tourism/heritage facilities and some areas of non development for nature conservation purposes.

RURAL DEVELOPMENT

Current situation

By contrast, the north of the catchment is generally rural. The land use in this area is split between grassland for livestock and cropping, particularly cereals. There is also a significant amount of woodland in the upper parts of the catchment including Epping Forest and Wormley Wood.



KEY

	Watercourse		Docklands		Possible Road Proposals		
	Catchment Boundary		Thames Gateway		Possible Rail Proposals		
	Urban area		Lee Valley Obj. 2		Life 94 Bid		
			City Challenge		Potential Development Sites	<p>Scale (approx)</p> <p>0 5 km</p> <p>FILE REF: LDMAPCCJ PRE REV 5.1 1801/95</p>	
			Green Belt				

RURAL DEVELOPMENT (Continued)**Current situation (Continued)**

Historically, horticultural crops were intensively grown along the Lee Valley, but their significance has dwindled and now only occupies around 5% of the cropped area. Recent changes to the Common Agricultural Policy (CAP) have led to the introduction of 'set-aside' for all but the smallest of farms. 'Set-aside' means that 15% of land used for growing cereals, oilseeds and protein crops, must be taken out of production. This has freed up significant amounts of land for other uses including the possibility of ecological areas.

Future situation

The Non Rotational 'Set-Aside' Scheme has just been introduced. This allows the area to be 'set-aside' to increase to 18% and the Habitat Creation Scheme allows the period of 'set-aside' to be extended to 20 years. This should allow more valuable ecological habitats to be created and could be used to create buffer zones around the remaining intensively farmed areas possibly helping to reduce the amounts of pesticide and fertiliser residues reaching rivers.

Map showing farm type to be inserted

3.14 MINERAL EXTRACTION AND SOLID WASTE DISPOSAL

Mineral extraction has the potential to alter the quality and quantity of flow in rivers or aquifers. Having extracted the mineral deposits, sites are frequently used for solid waste disposal. A valid planning permission is required for disposal of waste, this contains conditions which control how the site is restored and monitored preventing closed sites from causing future environmental damage. Sites restored as open water bodies have the potential to be used for recreation and conservation areas especially open water bodies.

Current Situation

Extensive deposits of sand and gravel on the floodplain of the River Lee have been extracted in the upper parts of the catchment, with former workings stretching almost continuously from Amwell Quarry on the northern catchment boundary down to Waltham Cross. Most of these have been restored as water features either for nature conservation or recreation, although former workings at Dobbs Weir are being restored to a golf course.

Existing extraction sites include several near Hoddesdon, a site at Waltham Cross, which will be restored to amenity grassland and a lake, and a site at Rye Meads where worked out areas have been restored to lakes and agricultural land. At Rye House there is also a rail served aggregates depot, an ancillary asphalt plant and permission exists for a 'Ready-Mix' concrete plant. There is a new permission at Cheshunt Park Farm which has yet to be worked. In the floodplain nearer London mineral extraction has been more limited with other development on the land effectively sterilising a number of reserves. The Lee Valley Park Plan 1986 does, however, make provision for further sand and gravel extraction within the park, subject to restoration conditions.

Solid waste disposal is undertaken at a number of sites including Hoddesdon, Cheshunt and Nazeing. The solid waste incineration plant at Edmonton has by far the largest capacity of the 30 existing household waste incinerators in the UK, with a design capacity of 400,000 tonnes/year. Considerable quantities of waste are also exported from London up through the catchment to sites located both in and beyond Hertfordshire. In line with this, there are a number of waste transfer sites within the catchment, such as those at Edmonton and Broxbourne. There are no sites within the catchment dealing with hazardous waste.

Future Situation

Given the relatively high water table along the floor of the Lee Valley, further worked out pits here are most likely to be restored as wetlands and lakes for water based recreation or nature conservation. Sites on plateau areas are more likely to be restored for agriculture or woodland.

There is a high demand for sand and gravel in London and new extraction sites are being sought. One possible site currently being considered is Rammey Marsh where gravel bearing land, which is currently within the curtilage of Rammey Marsh Sewage Works, is likely to become surplus to requirements.

There is also an increasing need for rail depots and wharfs in this part of the south east to handle London's increasing long-distance bulk imports of aggregates by sea and rail.

A recent report by South East Regional Planning Conference, December 1993 (SERPLAN) entitled 'Waste Planning: Numerical Guidance', included a scenario for increased waste recycling and incineration. This strategy, which represents a 'high, but feasible, level of incineration', includes the doubling of capacity at the Edmonton incinerator to 800,000 tonnes a year.

**Map showing gravel extraction, waste disposal and
water transfer sites to be inserted**

Flooding is usually a result of prolonged, or very intense, rainfall or rapid snowmelt. The NRA has to provide effective protection for people and property from flooding by constructing and maintaining flood defences. It also aims to provide timely warnings of any flood event. The frequency of a flood event peak flow is known as a return period, i.e. how frequently in a known time period will the flood occur. Flood defences are constructed to protect an area from a specific return period flood event. Different land uses are protected against different levels of flood.

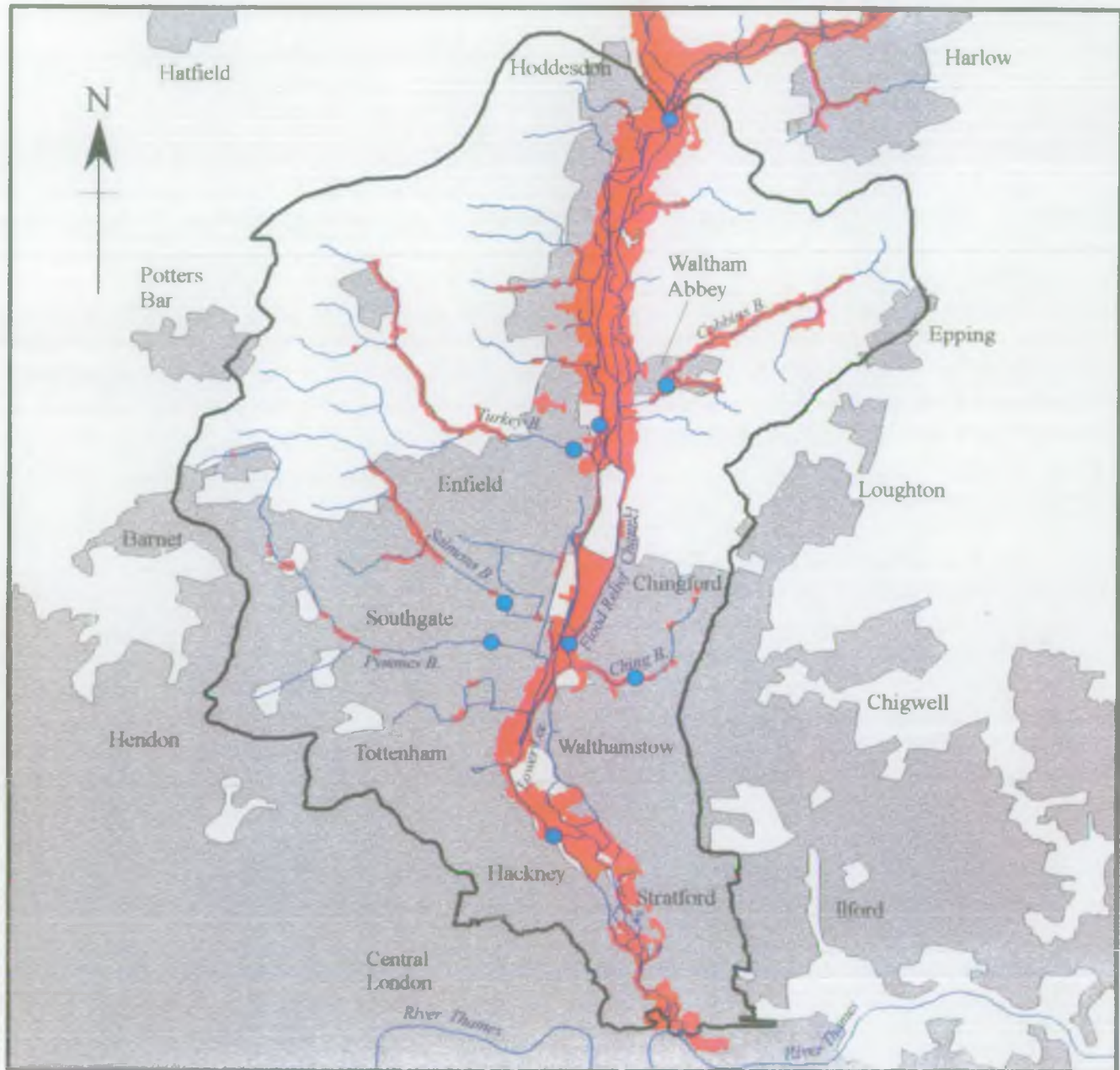
Current Situation

The Lower Lee has, until relatively recently, had a history of major flooding events. The large area of catchment upstream, the rivers in the Upper and Middle Lee catchments and the tributaries in the Lower Lee, all funnel water into the Lower Lee towards the River Thames. The wide low lying valley floor (the floodplain) adjacent to the river in this area allows water, once the river has overtopped its banks, to flood a large area, as opposed to being contained within a steep valley. The map opposite clearly shows the extent of this. This problem can be exacerbated by the tide coming up the River Thames which effectively prevents the water flowing down the River Lee from escaping into the estuary. To ease this, a tidal barrier was built at Bow Creek in the 1970s. This has now been removed because the Thames Barrier has since been constructed.

The last major flood in this area was in March 1947. This event was caused by a sharp rise in temperatures causing a rapid snow melt combined with rainfall. The resultant flood affected the whole of the Lee catchment. Within the Lower Lee, approximately 3,500 hectares (8,500 acres), were under water. This represents nearly 10% of the entire catchment area. The effects of this flood were that thousands of properties were inundated, causing a huge amount of damage, the true cost of which has never been fully calculated. Roads and communications were also disrupted and flood water contaminated some drinking water supplies and put some pumps out of action at the Lea Bridge Waterworks. This meant that over 1,000 tanker wagons were used to distribute around 14 million gallons of drinking water around north east London during the following days. Additionally, people in a much wider area had to boil their water because of the danger of contamination spreading throughout the system. The 1947 Flood was not an isolated incident as severe floods also occurred in 1919 and several times during the 1800s.

Since then a great deal of work has been carried out by the NRA's predecessors, the Thames Water Authority and the Lee Conservancy Catchment Board, to reduce the risk of flooding. The major works were carried out during the 1970's and involved building the Flood Relief Channel from Hackney to Feildes Weir. This channel is very wide and straight and is made from concrete in many places. It is designed to quickly remove water to the River Thames, therefore flows can be very fast and potentially dangerous during flood conditions. It has performed this function well as there has not been any significant flooding from the River Lee since it was built, even during the severe floods of October 1987 and October 1993.

There are still some areas prone to flooding in the catchment along the tributaries, in particular Cobbins Brook (at Waltham Abbey) and Nazeing Brook (at Nazeing). Other localised flooding may happen when blockages occur under bridges or in culverts, usually through a lack of maintenance. Flooding can also occur as a result of surface water drains being overloaded; rivers are not directly responsible for this type of flooding.



KEY

	Watercourse		Areas Known to Have Flooded				
	Catchment Boundary		River level warning stations				
	Urban area						

Scale (approx)
0 5 km
FILE REF: LLMAN/CA FILE REV 5.3 10/01/95

Current Situation (continued)

The NRA operate a Flood Warning System whereby future weather predictions, existing water levels and ground saturation are taken into account and the likelihood of flooding evaluated. This information is supported by gauges in the rivers which can trigger automatic alarms as water levels rise. Flood warnings can then be issued to the police and local emergency staff in areas at particular risk. This service is critical in giving people the maximum notice of the possible dangers.

If flooding does occur the NRA have approximately 100 direct labour staff who can be deployed to clear obstructions, set down sand bags and assist the emergency services in protecting people and property from flood waters. If need be, staff from other NRA offices and even the army can be called upon to help. The NRA also monitors the extent and depth of flood water in order to keep a record of where, how often and why floods occur.

Future Situation

The NRA will continue to provide flood warnings and carry out its own maintenance obligations to keep flood risk down to a minimum .

The NRA will also be investigating ways of making the Flood Relief Channel more beneficial for wildlife and examining opportunities for greater public access, bearing in mind the Health and Safety implications of allowing people close to a river which can be extremely dangerous.

During the NRA's routine river maintenance programme, including activities such as dredging, obstruction clearance, tree cutting and bank improvements, opportunities are increasingly being taken to incorporate environmental enhancements. This means, for example, that dredging is not carried out as often as it previously was. In addition some of the river bed material is often left in place rather than leaving the channel bed bare thus creating a potential habitat for invertebrates. There is an increased use of environmentally sensitive materials including geotextiles, recycled materials and more natural materials.

The NRA is also currently reviewing its emergency procedures and providing further training to it's staff for responding to emergency incidents.

Because of increased urbanisation since the Flood Relief Channel was designed and constructed, it is estimated that the level of protection it offers has been reduced. The NRA will be carrying out modelling and updating of the Area Liable to Flood, as required under S.105 of the Water Resources Act 1991.



Scale (approx)

0 5 km

FILE REF ULMAPCC4 PRE REV 5.3 10/01/94

The purpose of this section is to compare the current status or condition of the catchment (where it is now) with overall objectives/standards/targets (where they have been developed) in respect of water quality, water resources and physical features.

Bold text in italics on a shaded background indicates a matter that we feel may justify further action and is covered in more detail in Section 2.

Introduction

A principal aim of the NRA Water Quality Strategy (see Appendix I) is to achieve a continuing overall improvement in the quality of rivers through the control of pollution. To achieve this aim, the NRA seeks to maintain waters that are already of high quality; to improve waters of poorer quality and to ensure all waters are of an appropriate quality for their agreed uses.

Water quality improvements cost money and in many cases it is the public who pay the bill for these improvements, either directly or indirectly. It is important to relate the cost of any proposed improvements to the benefits in deciding on whether or not individual schemes should go ahead and in assigning priorities.

Surface Waters

Statutory Water Quality Objectives and General Quality Assessment

The NRA uses two principal schemes for the reporting and management of river water quality: the general quality assessment (GQA) scheme; and the statutory water quality objectives (WQOs) scheme. These schemes have replaced the water quality classification system used previously by the NRA (the NWC classification).

The GQA scheme is used to make periodic assessment of the quality of river water in order to monitor geographical and temporal trends. The scheme comprises four components - general chemistry, nutrients, aesthetics and biology - each providing a discrete 'window' upon the quality of river stretches. The general chemistry component of the GQA is in current use and comprises six tiered grades defined by standards for Dissolved Oxygen, BOD and Total Ammonia. Details of these standards are given in Appendix III. The remaining three windows are still under development and will be applied when available.

The current GQA chemical quality of rivers in the Lower Lee catchment is given on the map opposite. This shows the rivers in this catchment to be predominantly of grade C and D (i.e. of fair quality), with two reaches of the River Lee downstream of Tottenham Locks to Lea Bridge Weir and the Cuffley Brook being of grade E (i.e. of poor quality).

The WQO scheme establishes clear quality targets to provide a commonly agreed planning framework for regulatory bodies and discharges alike. The proposed WQO scheme is based upon the recognised uses to which a river stretch may be put. These uses include: River Ecosystem; Special Ecosystem; Abstraction for Potable Supply; Agricultural/Industrial Abstraction; and Water sports. The standards defining the five tiered River Ecosystem (RE) use classes, which address the chemical quality requirements of different types of aquatic ecosystems, were introduced by *The Surface Waters (River Ecosystem) (Classification) Regulations 1994*. (Standards for further uses are still under development). A description of each of the RE classes is given in Table 4. Details of the chemical standards for each class are to be found in Appendix III. For each stretch of river, a target RE class will be assigned, including a date by which this level of water quality should be achieved. Until WQOs are formally established by Legal Notice served by the Secretary of State, and therefore exist on a statutory basis, they will be applied on a non-statutory basis through a translation of River Quality Objectives (RQOs) from NWC classes to appropriate RE classes and target dates.



KEY

	Watercourse	GQA (1991 - 1993)					
	Catchment Boundary		Class B		Class D		
	Urban area		Class C		Class E	Scale (approx) 0 5 km	

FILE REF LLMAPCCTPRE REV.5.1 18/01/91

Statutory Water Quality Objectives and General Quality Assessment (continued)

A list of RQOs expressed as RE classes with target dates is given in Table 5.

The consistent achievement of a WQO of RE2 in the River Lee from its confluence with the River Stort downstream to Tottenham Lock by the year 2001 is dependent on planned investment by TWUL at Rye Meads STW. Similarly, the consistent achievement of class RE4 in the Salmons and Pymmes Brooks downstream of Deephams STW by the same target date is dependent on investment by TWUL at Deephams. The latter is being considered as one of the schemes to be funded in a discretionary programme of environmental improvement approved by the government. A decision of whether or not to include Deephams is expected by the end of December 1994.

The existence of a sustainable cyprinid fishery should be considered as a long-term target for water quality improvements in the Lower Lee. In order to achieve this vision, water quality would need to consistently achieve a WQO of class RE4. The proposed improvements at Deephams sewage treatment works are a factor in delivering this vision as would be any actions resulting from an investigation into the causes of fish kills in the Lower Lee currently bearing investigation by the NRA. In each case, the benefits of proposed improvements will need to be carefully considered in relation to the costs.

TABLE 7: DESCRIPTION OF THE RIVER ECOSYSTEM CLASSES

Class	Description
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 water quality which 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.



KEY

	Watercourse	Provisional Water Quality Objectives : River Ecosystem Class					
	Catchment Boundary		RE2		RE4		
	Urban area		RE3		RE5	Scale (approx) 0 ————— 5 km <small>PRLR PPLF LLMAPC02.PRE REV 5 J 1801/95</small>	

*Statutory Water Quality Objectives and General Quality Assessment (continued)***TABLE 8: WATER QUALITY OBJECTIVES**

WATERCOURSE	REACH	RQO
Cobbins Brook	Source - Lee	RE3 (1994)
Cuffley Brook	Source - Turkey Brook	RE5 (1994)
Lee	Stort - Kings weir	RE2 (2001)
Lee	Kings Weir - TottenhamLock	RE2 (2001)
Lee	TottenhamLock - Springhill	RE5 (1994)
Lee	Springhill - Lea Bridge Weir	RE5 (1994)
Lee	Lea Bridge Weir - CarpentersRoad	RE3 (1994)
Lee	CarpentersRoad - Thames	RE4 (1994)
Lee (Navigation 'A')	Lea Bridge Weir - Bow Locks	RE4 (1994)
Lee (Navigation 'B')	Kings Weir - TottenhamLock	RE3 (1994)
Pymmes Brook	Green Brook - Salmon Brook Salmon	RE3 (1994)
Pymmes Brook (L. Channel)	Brook - Lee	RE4 (2001)
Pymmes Brook (R. Channel)	Salmon Brook - Lee	RE4 (2001)
Salmon Brook	Stag Hill - DeephamsSTW	RE4 (1994)
Salmon Brook	DeephamsSTW - Pymmes Brook	RE4 (2001)
Small River Lee	Source - Lee Navigation	RE3 (1994)
Turkey Brook	Source - Small Lee	RE2 (1994)

EC Directives*The EC Directive on the Quality of Fresh Waters Needing Protection or Improvement to Support Fish Life (78/659/EEC)*

Three of the water quality reaches in this catchment have been designated under this directive as being capable of supporting cyprinid (i.e. coarse fish) fish populations. The remaining 14 reaches are not currently designated. The reaches and their designations are shown in Section 3.7. All the designated reaches passed the water quality standards given in the directive for the 3 year period 1991 - 1993.

*EC Urban Waste Water Treatment Directive (91/271/EEC):**Sensitive Areas (Eutrophic)*

The urban waste water treatment directive sets priorities for the treatment of sewage according to the size of the discharge and the of sensitivity of the receiving waters.

Receiving waters which may be subject to eutrophication problems are to be designated as sensitive areas (eutrophic) by government under the directive and phosphorus removal at sewage treatment works discharging into these receiving waters is to be considered. The River Lee has not been designated as a sensitive area (eutrophic), however information on the eutrophic status of the River Lee is being collected for a review of designated areas to be carried out by the Government in 1997. Orthophosphate, phosphate and chlorophyll concentrations are monitored at sampling points on the River Lee and the Salmons Brook and a three year biological survey of macrophytes in the Lower Lee catchment is being undertaken.



KEY

	Watercourse	Water Quality - EC Directives					
	Catchment Boundary		Class Cyprinid		EC Dangerous Substance monitoring point		
	Urban area			1. Dobbs Weir 2. Lee Valley Road 3. Salmons Brook 4. Lea Bridge Weir 5. Carpenters Road		Scale (approx) 0 ————— 5 km <small>FILE REF: LLMAPCC2.PRE REV.5.1 18/01/97</small>	

*EC Directives (Continued)**The EC Directive on Pollution caused by certain Dangerous Substances discharged into the Aquatic Environment of the Community (76/464/EEC)*

This directive is concerned with reducing pollution caused by substances known to be particularly hazardous to aquatic life. The substances which come under the control of the directive have been selected mainly on the basis of their toxicity, persistence and potential to accumulate in biological organisms. The substances include specific organic compounds such as pesticides and solvents, and specific metals.

Rye Meads sewage treatment works receives trade effluents containing pentachlorophenol (PCP), mercury and cadmium, and these substances are routinely monitored in the discharge from the works and also below the discharge at Dobbs Weir on the River Lee. The environmental quality standard for the receiving water was achieved for the three year period 1991 - 1993.

The discharge consent from Deephams' sewage treatment works contains a limit on the concentration of cadmium in the discharge and the concentration of this metal is also determined in the Salmons Brook downstream of the discharge. The consent condition and the environmental quality standard for the receiving water was complied with in all of the samples taken in the three year period 1991 - 1993.

In addition to monitoring specific discharges, environmental monitoring is carried out in the River Lee for a number of other dangerous substances. Those substances most frequently detected are the solvents chloroform, trichloroethylene and tetrachloroethylene, the pesticide hexachlorocyclohexane (HCH) and cadmium. The environmental quality standards for most of these substances were not exceeded for the 3 year period 1991-1993. The only exceptions have been elevated concentrations of chloroform at Carpenters Road in 1991 and failures against the standard for HCH at Lea Bridge Weir and Carpenters Road. These failures are being investigated.

Biological River Quality Monitoring

The health of rivers is reflected in the variety and abundance of animal and plant life they support. The NRA routinely monitors the macroinvertebrate life in rivers, streams and canals. Aquatic macroinvertebrates are small, relatively immobile animals that are continually exposed to changes in water quality. Samples are routinely collected at sites which represent the water quality reaches sampled chemically and provide further spatial coverage within the area. Biological monitoring provides a useful measurement of water quality since results take into account the effect of intermittent pollution which may remain undetected by standard chemical methods. Biologists also examine the effects of significant pollution incidents upon macroinvertebrates to establish the damage caused.

The biological quality of a site is shown by the number of different macroinvertebrate taxa present and by their individual susceptibility to pollution. This is measured by using the Biological Monitoring Working Party (BMWP) score system. BMWP scores above 100 generally indicate good diversity, whilst scores below 20 occur at the most polluted sites. The most natural rivers and streams in this area frequently achieve BMWP scores in excess of 150. It can be difficult to distinguish water quality limitations from the effects of artificial physical conditions and poor habitat provision which occur widely in urban areas. To overcome this, the Average Score Per Taxa (ASPT) is a particularly useful index because it measures the balance between pollution-tolerant and pollution-sensitive taxa. ASPTs below 3.00 are found at the most polluted sites, whilst values nearer 5.0 occur if water quality is not a limiting factor.

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Current Biological Status

The average BMWP results obtained at sites during 1991-94 are represented on the map opposite. Appendix III provides a table summarising the current and historical BMWP and ASPT scores obtained at sites.

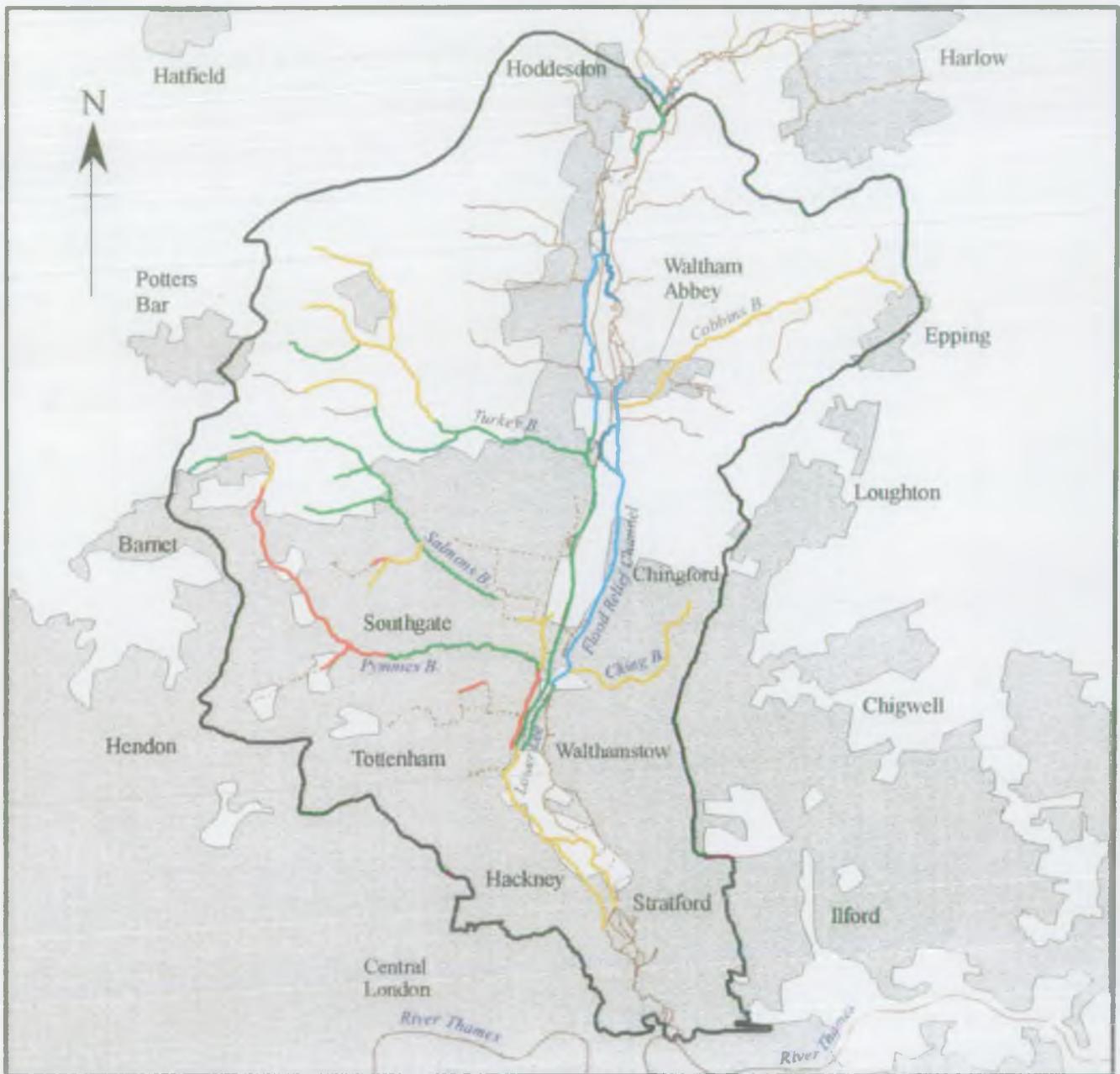
The biological quality of watercourses in this catchment varies greatly. The wide range of aquatic habitats found in the catchment produces corresponding differences in biological potential. However, water quality influences such as urban run-off and large sewage treatment works discharges are invariably the sole cause of poor biological river quality (shown by BMWP scores below 50) in this area.

Sections of good or very good biological quality can be found throughout most of the River Lee below Feildes Weir downstream to the river's confluence with the Pymmes Brook. Biological quality is also generally good in many of the associated channels found in this section of the Lee valley such as the Small River Lee, New Cut, Cornmill Stream and Old River Lea.

BMWP scores are reduced in parts of the Lee Navigation and the Lee Flood Relief Channel primarily as a result of limited habitat, rather than water quality. The most diverse macroinvertebrate communities are found where there is relatively clean, faster flowing water within a more natural channel, as with sections of the River Lee below Kings Weir and Enfield Weir. Pollution-sensitive mayflies and caddisflies are characteristic of these and other relatively clean sites.

Below the confluence of the Pymmes Brook with the River Lee there is a marked deterioration in biological quality attributable to water quality limitations. Quality is poor in both the Lee Navigation and River Lee below this point, although some recovery is apparent in the lowest section of navigation located above the tidal limit at Old Ford Locks. Below this point, no significant biological data is available for Bow Creek. There is a need to obtain baseline information for this important transitional zone between the freshwater River Lee and Tidal River Thames.

The impact of urbanisation upon water and biological quality is most acute in the tributary streams and brooks. The Pymmes Brook and Moselle Brook drain extensive urban areas and so receive large volumes of urban run-off. Diffuse pollution sources such as domestic sewer misconnections or minor pollution incidents are widespread. As a result, the fauna of these heavily urbanised streams is particularly poor and restricted to pollution-tolerant macroinvertebrates such as snails, leeches, and worms. Streams draining more rural or green belt surroundings such as the Turkey Brook, Theobalds Brook and upper parts of the Salmons Brook generally have a fair or locally good biological quality indicative of relatively clean headwaters. However, local agricultural or urban influences can have marked impacts within these small tributary catchments. No recent biological information exists for several tributaries such as the Spital Brook, Turnford Brook and Nazeing Brook.



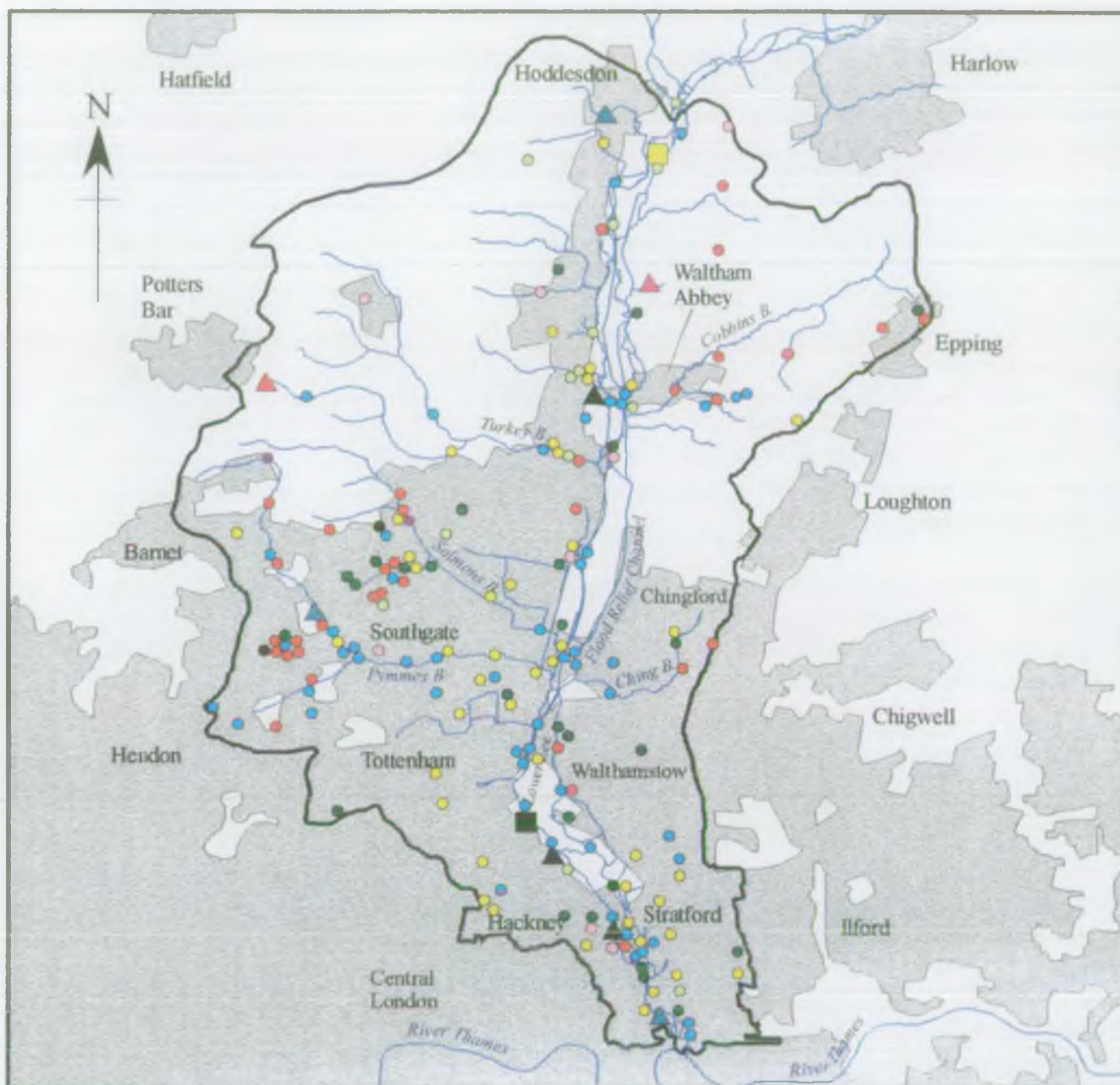
KEY

Catchment Boundary		Mean BMWP Score (1991 - 93)				Scale (approx) 0 5 km FILE REF: LLMAP002.PRF REV:5.3 10/01/95
	Urban area		A Very Good (> 150)		D Poor (21-50)	
			B Good (101 - 150)		E Very Poor (0 - 20)	
			C Fair (51 - 100)		No Data	
	Culvert					

*Pollution Incidents***TABLE 9: POLLUTION INCIDENTS IN THE LOWER LEE**

	91/92	92/93	93/94
Major	2	1	2
Significant	9	11	7
Minor	188	163	205
Oil	64	68	66
Chemical	23	18	29
Sewage	45	32	37
Natural	14	15	12
Agricultural	5	4	3
General	31	27	48
Urban Run-off	3	7	5
Not Known	14	4	14
Poll: Yes	114	97	105
Poll: No	85	78	109
Total Reported	199	175	214

The range of pollution incidents in the Lower Lee is typical for a generally urbanised catchment. Oil, sewage and chemical incidents respectively predominate, but it should be understood that the majority of these incidents are of a very minor nature, even where pollution is confirmed. As would be expected with the nature of the catchment, agricultural type incidents are low in number. The total number of incidents reported for the past three periods ending August 1994, were 199, 175 and 214 for each year respectively. Examination of the numbers of specific types of incidents does not show any particular trend.



KEY

	Watercourse	INCIDENT CLASS			Oil		General
	Catchment Boundary		Major Category 1		Chemical		Urban Runoff
	Urban area		Significant Category 3		Sewage		Not Known
			Minor Category 3		Natural	Scale (approx) 0 5 km FILE REF: LLMAPCC3.PRE REV: 1.1 10/01/95	
		INCIDENT TYPE			Agricultural		

Bacteriological Status

Bacteria are naturally present in rivers in small quantities which are generally not a health hazard. However, in larger numbers there is an increased risk of there being concentrations of dangerous bacteria and viruses which could pose a risk to health. The amount of dangerous bacteria present is so low that it is extremely difficult to detect. Therefore, the NRA carries out bacteriological sampling of micro organism E.coli. E.coli is present naturally, but is in particularly high concentrations in sewage. Although it is not a serious health hazard in itself, where it is found in high concentrations it indicates a likelihood of the presence of potentially dangerous levels of pathogens.

The NRA sampled the River Lee Navigation quarterly in 1991. The geometric mean of these 'snapshot' samples are shown on the map opposite. The figures are given in Appendix III. Overall the levels in the Navigation were low (below 1000 E.coli/100 ml) this is seen as typical natural background levels. There are two stretches where levels increased, the first (2500 E.coli/100 ml) was detected at Dobbs Weir. This level (1000-10000 E.coli/100 ml) is typical for water containing safely treated sewage effluent and this site is the first sample downstream of Rye Meads Sewage Treatment Works.

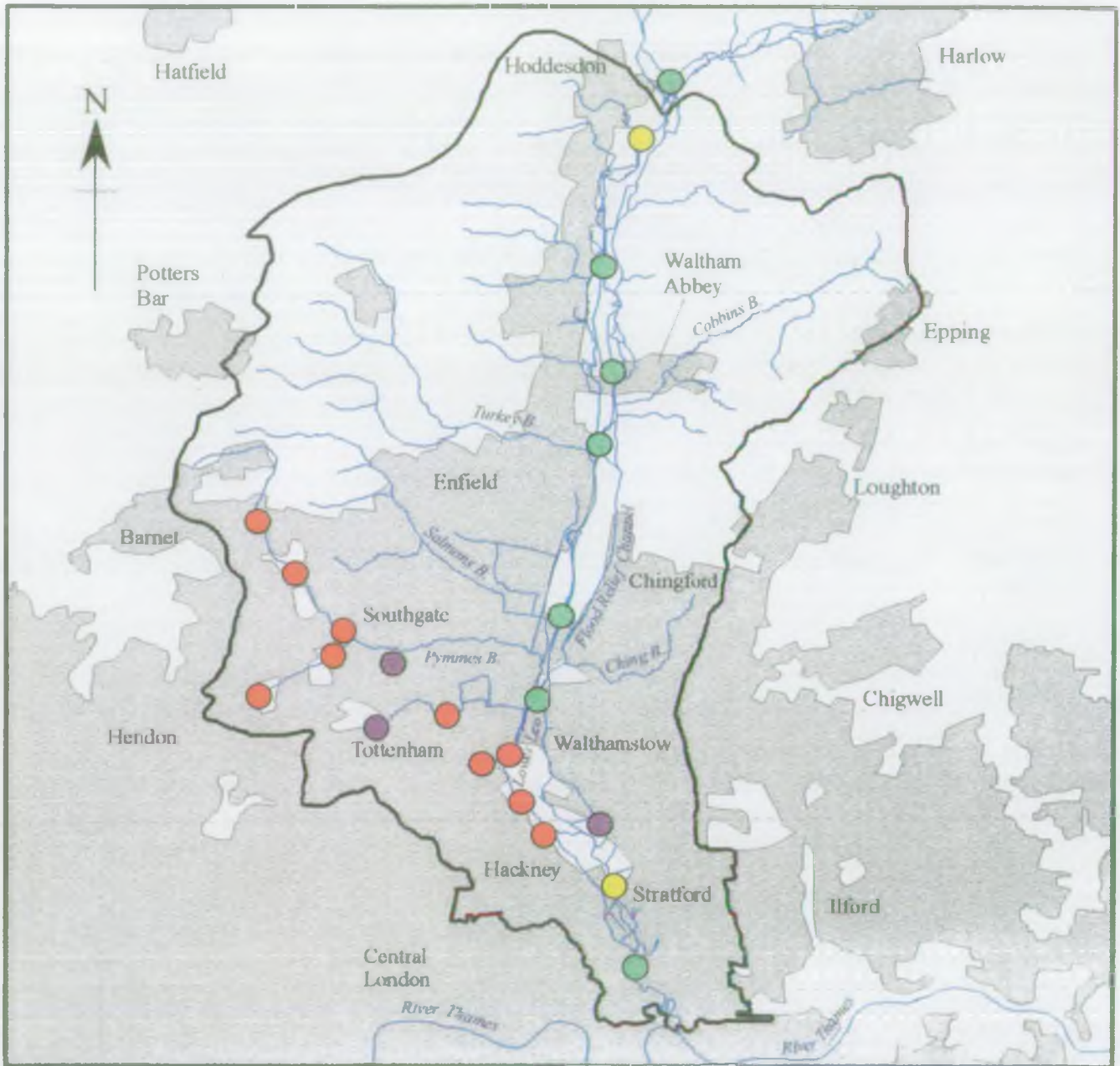
Of greater concern are the reaches downstream of Pymmes Brook to Lea Bridge Weir where E.coli levels are in excess of 10000/100 ml indicating poorly treated sewage and/or raw sewage. This area coincides with inputs from the Pymmes Brook, Salmons Brook, Moselle Brook and Deephams Sewage Treatment Works. The initial sampling could not identify the source, or sources, of this pollution precisely so the NRA undertook further sampling on the Pymmes Brook and tributaries, Moselle Brook and Dagenham Brook during 1994. The results of this work are also shown on the map opposite and in Appendix III.

All of these rivers show extremely high levels of E.coli, in excess of 1000000 E.coli/100 ml in certain samples, indicating areas of gross faecal contamination. The highest concentrations of bacteria present a potential health hazard, but it is the responsibility of the local authority and the Environmental Health Officer to determine this.

Bacteria die off quickly in water, usually within 24 hours. This can make it difficult to trace the sources of such contamination.

The programme of monitoring undertaken by the NRA has identified particular rivers, but further work is needed to detect other problem areas and to determine the impact of Salmons Brook and the Deephams Works on the level of bacteria.

The most likely causes of these pollution sources are misconnections of foul water and sewage into surface water drains, leaking sewers and overflows from combined sewers. Once the worst problem areas have been identified, more concerted efforts can be made to remedy these diffuse pollution sources.



KEY

	Watercourse	Faecal coliforms/100ml (Geometric mean)				
		Low		High		
	Catchment Boundary	●		●		
	Urban area	●	Moderate	●	Very High	
						Scale (approx) 0 5 km FIG 8 REF LEMAPCS PRE REV 5.3 16/01/95

Groundwater

The underlying geology of the catchment (see Section 3.4) consists of river gravels overlying London Clay which in turn overlies the Chalk aquifer. Water can be found in two of these layers. The first, in the river gravels, 'perched groundwater', is a minor water resource which is isolated from the main body of groundwater by the London Clay. However, it is in continuity with surface water in some places and therefore if this water becomes contaminated, it could potentially leach into the surface water system and pollute rivers and streams.

The second groundwater resource is in the Chalk aquifer which is where the main body of groundwater is to be found. On the whole it is protected from pollution because of the layer of impermeable London Clay that lies above it. However, there have been cases of pollution occurring to this resource. This could be through deep excavation works or through contaminants getting into boreholes. Pollution of the Chalk aquifer, which is a source of drinking water, must be avoided as it is expensive and potentially impossible to clean up.

Additionally, this catchment has a series of 'swallow holes' around Cuffley. These are a natural phenomena which allows surface water directly into fissures in the Chalk. Water then travels along these fissures to public water abstraction points in the northern part of the Lower Lee catchment and indeed into the southern part of the Middle Lee catchment. Clearly any pollution could also be carried along these routes which must be prevented to avoid contaminating drinking water supplies.

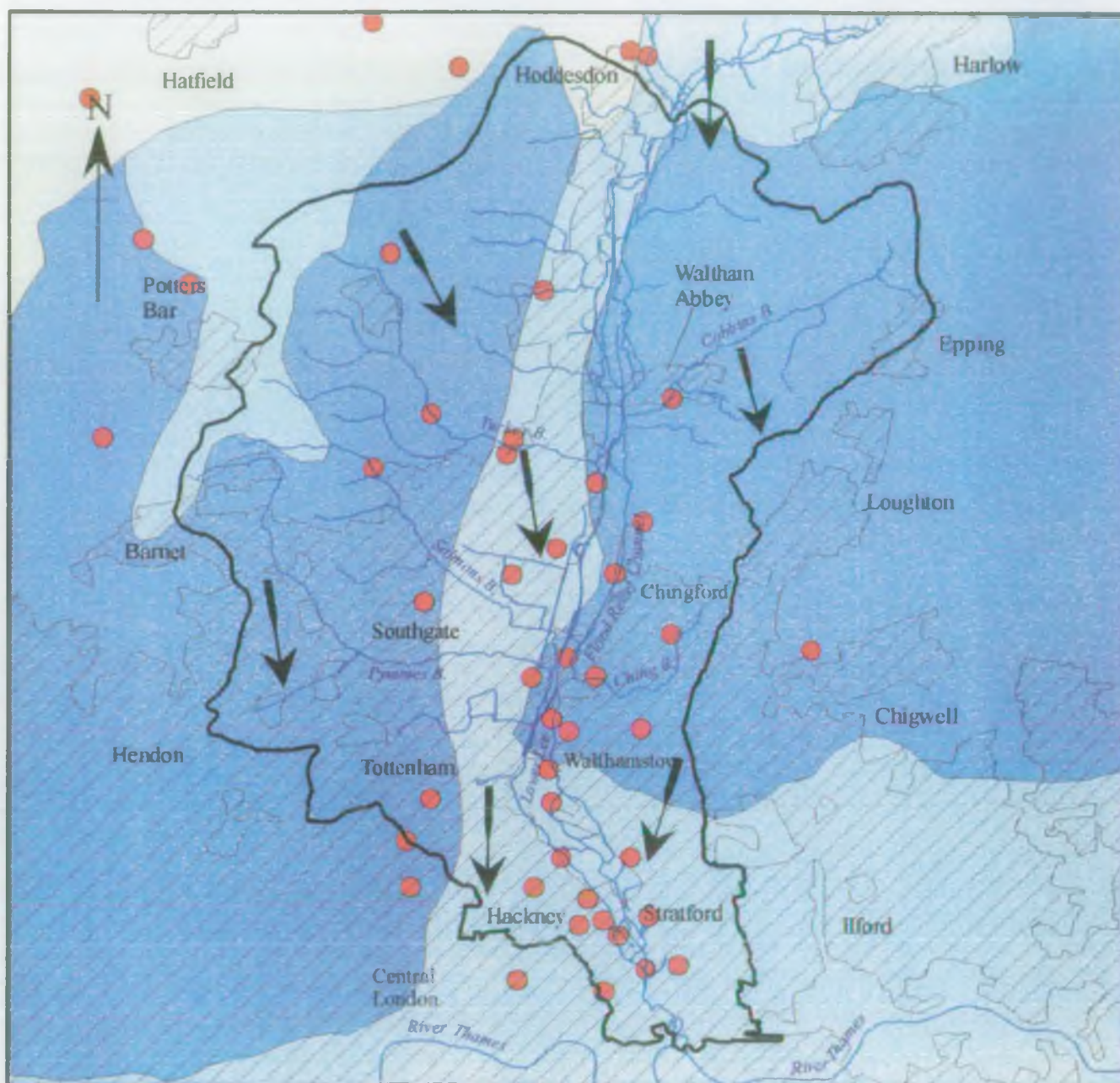
Mineral extraction and associated land filling has occurred along the Lee valley. Waste disposal sites that have taken putrescible waste may generate leachate which could pose a risk to groundwater, especially older ones which may not have such advanced containment facilities.

In the London area of this catchment there are large areas of contaminated land which are not currently on any formal register. Redevelopment of sites which the NRA consider may be contaminated, requires site investigations to determine the nature and extent of any pollutants. The NRA is currently investigating compiling it's own records to assist with it's aim of reducing pollution to groundwater.









Our document "Policy and Practice for the Protection of Groundwater" (PPPG) sets out the NRA's approach on this subject. This includes the definition of protection zones around key boreholes, the classification of aquifers depending on their vulnerability (see map opposite) and a list of specific contaminative activities requiring high standards of control. Certain controls are available to the NRA and local authorities who can play a major role in influencing the locations of development which may pose a risk to groundwater. A comprehensive NRA monitoring network is currently being established (see map opposite) to enhance groundwater quality evaluation. This will be complemented with site specific initiatives.

Groundwater vulnerability from pollution depends upon the presence and nature of the overlying soils, the geology and the depth of the water table. In accordance with the NRA's PPPG, 1:100 000 scale maps are being produced which show groundwater vulnerability (not taking water table depth into account). These maps and their accompanying user manuals are scheduled to be completed by mid 1996.

An extract from a 1:1 million scale map has been reproduced for this catchment (see opposite). Because of the scale, this map can only be taken to show general categories of vulnerability. Nevertheless the principles outlined above constitute the basis of information upon which resource protection measures are applied by the NRA.



KEY

	Watercourse	GROUNDWATER VULNERABILITY CLASSIFICATION		 	Groundwater Borehole / Observation Site		
	Catchment Boundary		Major Aquifer / Intermediate				
	Urban area		Minor Aquifer				
			Non - Aquifer				
						<div>Scale (approx)</div> <div><div></div>05 km</div>	
FILE REF: ULMAP007 PRE REV 5.3 18/01/95							

Water Resources Management

In managing water resources, the NRA seeks to achieve a sustainable balance between the needs of the environment and the needs of abstractors for public and private water supply. In carrying out our water resources activities we have general duties to further the conservation and enhancement of the natural environment and have particular regard for the statutory obligations of the water undertakers.

Abstraction Licensing Policy

The NRA's regulatory role in the management of abstraction is governed by the Water Resources Act 1991 which sets out a system of Abstraction Licensing (see Section 3.11) which allows the NRA to control the abstraction of water. The Act also sets out those matters which the NRA must take into account when considering an application for a licence (e.g. whether the requirements of the applicant are reasonable; the impact on other water users; the impact on river flows), and describes the procedures which must be followed when applying for a licence. Licences enable the NRA to control abstractions by setting limits on the amount which may be taken, the purposes for which water may be used and any necessary conditions to protect the environment.

In response to its duties under the Water Resources Act, the Thames Region of the NRA has developed a set of formal policies for handling applications for licences and changes to existing licenses (see Appendix III). These policies do not, in general, allow the abstraction of water from rivers (or nearby groundwater) for a consumptive use in the summer months, and encourage the development of winter storage for uses such as spray irrigation.

The Water Resources Act also establishes the power to specify Minimum Acceptable Flows in rivers. The NRA, in response to this, is carrying out research into Ecologically Acceptable Flows, which will help our understanding of what a living river needs to survive. Many new licenses, particularly for consumptive uses, will include a prescribed flow condition limiting abstraction below defined river flows in order to protect the water environment.

Catchment Perspective

Public Water Supplies

The principal water (and sewerage) undertaking and abstractor in the catchment is Thames Water Utilities Ltd. Three Valleys Water Services Plc also supply some parts of the north of the catchment area.

Nearly a sixth of London's water supply is derived from water resources in the River Lee catchment based around the complex of reservoirs and Coppermills water treatment works in the Lower Lee catchment. Water pumped from Chalk groundwater wells to the north of the area is conveyed, via the New River, to Coppermills supporting river water abstracted into reservoir storage. These resources are operated conjunctively with River Thames-derived water which is pumped across to Coppermills via the Thames-Lee tunnel. This is an important feature of water resources management for the north of London, particularly during times of drought.



KEY

	Watercourse	RESERVOIRS		WATERWORKS
	Catchment Boundary	A. King George's Reservoir	G. Walthamstow Reservoirs Nos 1 - 5	W. Coppermills Waterworks
	Urban area	B. William Girling Reservoir	H. Walthamstow Reservoirs Nos 1 - 5	X. Lea Bridge Waterworks
	The New River	C. Banbury Reservoir	I. Walthamstow Reservoirs Nos 1 - 5	Y. Hornsey Water Works
	Water Transfer Pipe	D. Lockwood Reservoir	J. Walthamstow Reservoirs Nos 1 - 5	
		E. Low Maynard Reservoir	K. Walthamstow Reservoirs Nos 1 - 5	
		F. High Maynard Reservoir	L. Warwick Res. East	
			M. Warwick Res. West	
			N. Stoke Newington Reservoirs	
			O. Stoke Newington Reservoirs	

Scale (approx)
0 5 km
FILE REF: LMAFCS PRE REV 53 1995/96

A diagrammatic map showing water supply to be inserted

Catchment Perspective (continued)

The recent development of the London Water Ring Main by Thames Water Utilities Ltd will provide more flexible distribution of water resources across the majority of London. The Ring Main links in to Stoke Newington and from there into Coppermills providing essential water supply security in all but extreme drought conditions (such as those witnessed recently and during 1976) to the Lower Lee area and North London generally.

The Lower Lee is also used to support public water supply needs to the east of the catchment. Thames Water Utilities Ltd operate a bulk water transfer to Essex and Suffolk Water Plc requiring, at times, up to 91 Ml/d to be exported out of the catchment.

Rising Groundwater Levels

In the early 1800s prior to any groundwater development, artesian conditions existed over much of the Lower Lee valley, ie if a borehole had been drilled through the confining tertiary strata into the Chalk, groundwater would have overflowed at the ground surface. With the commencement of groundwater abstraction, groundwater levels were drawn down significantly. Since the 1970s they have been recovering because industry has progressively moved out of London and therefore abstraction rates have declined.

Along much of the Lower Lee valley, north of Stratford and Hackney, abstraction is continuing with the operation of Thames Water's 'North London Scheme'. Further south however, monitoring by the NRA has been indicating a rise in Chalk groundwater levels of approximately 1-1.5 m/year over the past few years. In this area there is a significant thickness of London clay overlying the Chalk and, therefore, such a rise will not impact on shallow foundations and basements within the area, but may in future affect the soil strength beneath exceptionally deep foundations. There are virtually no tunnels constructed within this area and those that are, are fairly shallow constructions. NRA Thames Region, continue to monitor Chalk groundwater levels from an extensive observation borehole network and produce annual maps of Chalk groundwater level and the rate at which it is rising.

Water Resources Development

Future water resources need to be considered in the context of London as a whole given the conjunctive management of resources outlined above. Growth in demand for water may be influenced by a number of factors: for example, by increasing water use in the home, population growth and local development pressures and economic trends which may affect commercial water usage. "Future Water Resources in the Thames Region", published in June 1994, sets out a strategy for the future planning and sustainable management of water resources to meet the reasonable needs of public water supplies, industry and agriculture in the region. Managing growth in demand for water is a key element of the strategy. Managing leakage and encouraging more efficient use of water at work and at home can significantly affect growth in demand for water delaying the need for major new strategic water resource schemes and perhaps avoiding their development altogether for the foreseeable future.

Groundwater resources in the centre of the catchment, in the Enfield-Haringey area, are currently being enhanced by an extension of a scheme which artificially replenishes groundwater storage - or artificial recharge. Whilst groundwater levels in Central London are slowly rising, increasing abstraction in the nineteenth and early twentieth centuries have led to a progressive decline in

Water Resources Development (Continued)

groundwater levels in the outer areas of the confined Chalk aquifer of the London Basin. This is being developed by Thames Water Utilities Ltd as additional storage instead of building major new reservoirs. The amount of water stored in the aquifer can be managed by recharging with treated mains water, a surplus of which is available in the existing distribution system at times of seasonally low demand. This provides significant additional resources to meet drought deficiencies in the surface water resources supplying London. Between major abstraction periods, the aquifer is recharged by a combination of natural recovery (from rainfall) and by artificial recharge.

Should growth in demand for water continue, in the longer term this may contribute to the need to develop larger strategic water resource schemes. "Future Water Resources in the Thames Region" identifies a number of schemes which may be developed in this respect; two of which include:

- a scheme to transfer water from the River Severn to the River Thames at times of low flow;
- the proposed reservoir in south west Oxfordshire.

Further investigations are being carried out into potential strategic water resource schemes but their promotion should not be seen as a foregone conclusion because of significant environmental impacts and planning constraints.

Landscape

Some sections of the River Lee Flood Relief Channel and some adjacent rivers were the subject of Landscape Assessments in 1991 and 1993. The rest of the river corridors in the catchment are due to be surveyed and assessed during 1994/95. The Surveys identify landscapes on a scale of CLASS 1-4 (1 being very positive in character with many valued features which are essential to conserve; 4 being negative in character with few positive features, offering scope for enhancement). Assessments are also made to determine whether the appropriate management is:

- | | |
|---------------------|--|
| Conservation | Emphasis on conservation of existing character and an appropriate management of particular features which contribute to this character. |
| Restoration | Emphasis on restoring landscape character where this is being eroded. |
| Enhancement | Emphasis on the enhancement of landscapes which have completely lost their former character and are downgraded, derelict or otherwise damaged. There may be opportunities to create new types of landscape as a result of enhancement. |

The northern section of the Flood Relief channel, Feildes Weir - Waltham Abbey, is characterised by the wide, flat valley of the River Lee which has been extensively modified by man, particularly old gravel workings. The landscape has been given a combination of CLASS 3 and 4 and the management strategy assessed as **Enhancement**. The Flood Relief channel through Enfield and Edmonton has also been allocated classes 3 and 4 because of its heavily urbanised character and artificial nature, concrete channel and reservoir embankments dominating. Again the management strategy is **Enhancement**.

In contrast, the River Lee Navigation has been allocated CLASS 2 because it has some attractive and tree lined sections incorporating positive features typical of canal infrastructure and furniture. Its management strategy is **Restoration**.

Overall, the landscape assessments completed so far have indicated that one of the major sources of visual intrusion within the immediate channel environment is the NRA's own infrastructure like weirs, sluices and fencing.

Geomorphology

Rivers naturally change their course and flow over time, but with human interference, i.e. channel straightening and weirs, the flow rate is altered which leads to different erosion and sediment patterns.

Notable erosion and sedimentation problems have been appraised in the Cobbins and Salmons Brooks in recent years. Increased urban run-off along with straightened channels has caused erosion of the gravel beds and sands along these tributaries.

Land Use Planning

Government policy on Town and Country land use planning highlights the importance of good communications between the NRA and local planning authorities. This is because development application decisions made by local planning authorities may lead to detrimental impacts on the quality of the natural water environment.

Land Use Planning (Continued)

Increased demands for water supply and effluent disposal, construction of property in the flood plains of rivers, and the indirect impacts on flora and fauna dependent on specific conditions are just some of the considerations that have to be weighed up during the process of making decisions on development.

The NRA role in this process is as a statutory consultee. We take this role very seriously and seek to influence policy making at national (e.g. Planning Policy Guidelines such as PPG12 on the content of development plans and PPG23 on pollution and planning controls) regional (e.g. Regional Planning Guidance for the South east of England which raises the need for local planning authorities to take full account of the water environment when preparing development plans) and local (e.g. Structure and Local Plan preparation) levels so that decisions made by local planning authorities take into account all the relevant issues.

The NRAs Planning Liaison and Development Control teams examine planning applications and enquiries from developers to determine the impacts on the water environment. During 1994 approximately 300 planning applications were commented on within the catchment, many of these needed research into several possible impacts.

The NRA can provide advice on the impacts of developments which planning authorities must have regard to, but they are not obliged to follow. Our advice takes the form of either reasons for refusing planning applications, where we consider the adverse impacts to be unacceptable, or reasons for control certain aspects of the development by using conditions, or purely advice on the proposals which would be of benefit say, only to the developer/occupier or would provide an improved standard of pollution prevention.

Within the Lower Lee the NRA is particularly keen to ensure that (i) existing open rivers are kept that way by seeking to avoid culverting and to re-open culverted sections of river where opportunities arise; (ii) when redevelopment occurs on potentially contaminated sites, surveys and remedial works must be done to ensure that any risk of pollution is kept to a minimum; (iii) any development which could result in an increased flood risk is avoided.

We have been working with all the relevant local planning authorities (see Section 3.2) to integrate water environment issues into their statutory land use development plans. Our "Guidance notes for local planning authorities on the methods of protecting the water environment through development plans" (NRA, January 1994) covers the following issues:

- waste water management
- surface water protection
- groundwater protection
- availability of water resources
- protection of the floodplain
- surface water run-off
- tidal and fluvial flood defences
- river corridors and coastal margins
- navigation
- mineral workings and waste disposal.

Land Use Planning (Continued)

The overall extent to which these policy interests have been taken up by local planning authorities is as follows:

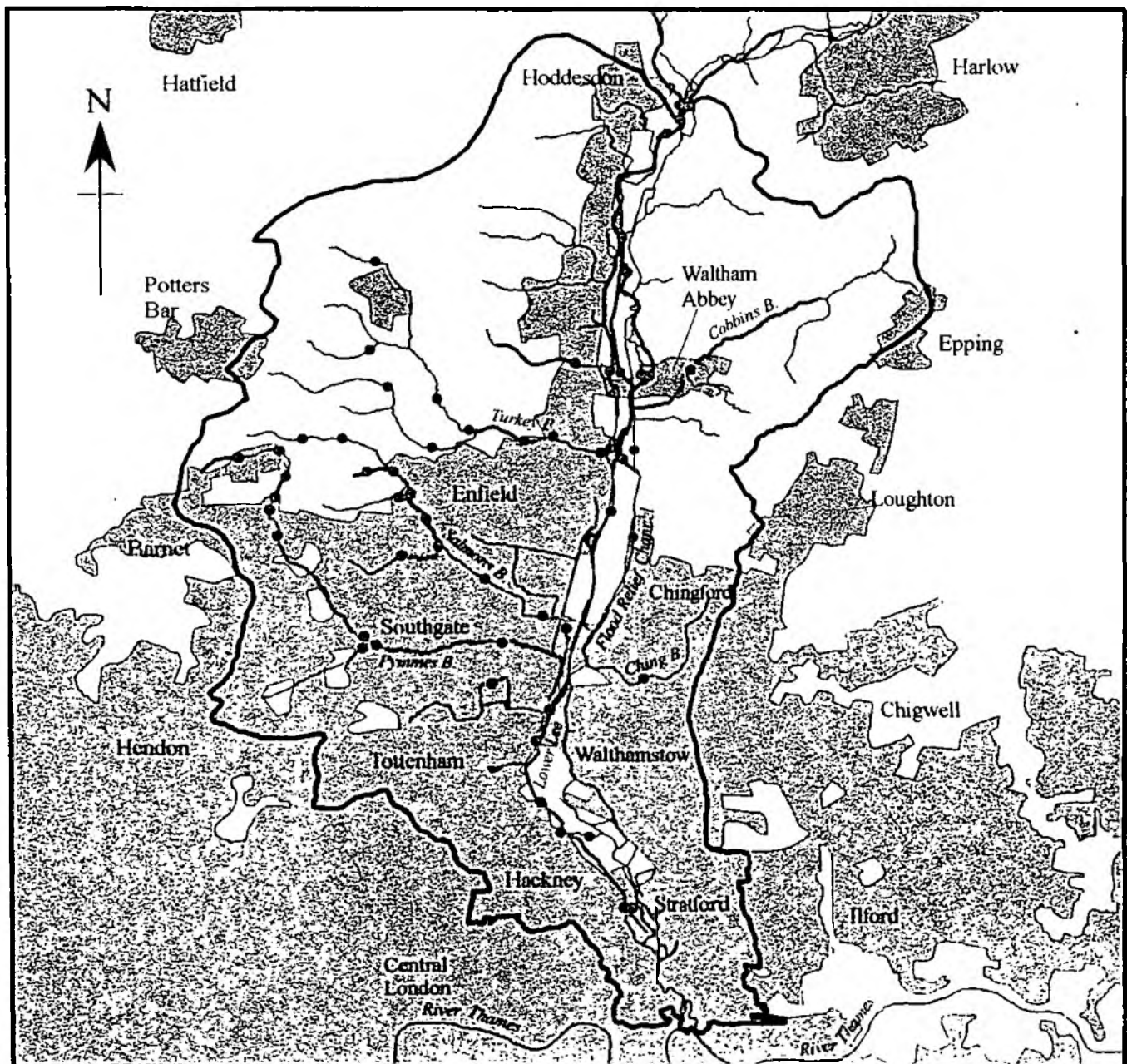
Barnet	85%	Hertsmere	53%
Broxbourne	64%	Newham	70%
East Herts.	36%	Redbridge	30%
Enfield	59%	Tower Hamlets	83%
Epping Forest	75%	Waltham Forest	85%
Hackney	36%	Welwyn Hatfield	46%
Haringey	90%		

These figures, however, can be slightly misleading as they do not take into account the timing of plan production. For instance, the East Herts. Local Plan reflects the concerns of the NRA as expressed in 1991 rather than the full range of issues we now promote. Clearly the NRA will be working with the relevant authorities to improve their coverage of water issues as opportunities arise. However, a reasonable level of policies has been achieved.







It is hoped that local authorities will work with ourselves so that the information and actions arising in Catchment Management Plans will be integrated into their own local plans. The Final Plan for the Lower Lee will contain a 'Land Use Statement' which will draw to the fore key land use planning issues needed to be covered in development plans.

Biological Diversity

Biological surveys have identified sections of relatively natural macroinvertebrate diversity (ie freshwater shrimps, water bugs, mayflies, beetles and snails). The map opposite shows good sections of watercourse where the Ecological Quality Index (EQI) number of taxa (as sampled) achieved or exceeded the predicted number of taxa by a computer model. These sections tend to reflect the distribution of semi-natural channel features and relatively clean water. The greatest macroinvertebrate diversity is found within sections of the River Lee below Kings Weir and Enfield Weir. However, examples of faunas of high ecological value can be found in a range of watercourse types from small headwater streams to parts of the Lee Navigation. The map also shows poor sections where the number of taxa is less than 10 and the ASPT score is less than 3.5. These are sections of restricted bio-diversity caused by poor river habitat and/or poor water quality. Examples of poor habitat include concrete river banks and bed, straight sections of river, uniform channel cross sections, all of which are very unnatural features.



KEY

	Watercourse	BIOLOGICAL DIVERSITY :				
	Catchment Boundary		Good Biological Diversity			
	Urban area		Poor Biological Diversity		<div>Scale (approx)</div> <div>05 km</div> <div>FILE REF: LLMAP004PRE REV 5.1 10/01/95</div>	
			Biological Sampling Site			

Appendix 1:
Organisational Responsibilities and NRA
Aims and Objectives and strategies

Appendix 2:
Report on Informal Liaison

Appendix 3:
Supporting Information

Appendix 4:
Glossary

INTRODUCTION

The supply of water for domestic consumption and industrial use is not the responsibility of the NRA but of **water and sewerage undertakers**. The prices charged by these private companies are regulated by the **Office of Water Services**. The quality of water supplied for consumption is monitored by the **Drinking Water Inspectorate** and **District or Borough Councils**.

The disposal of sewage effluent is the responsibility of **water and sewerage undertakers**. Their discharges are subject to control by the NRA. Potentially significant industrial discharges to the water environment are controlled by **Her Majesty's Inspectorate of Pollution**.

The NRA has the primary responsibility for flood defence and land drainage matters but on "ordinary watercourses" the responsible land drainage and flood defence agency is the **District or Borough Councils** who may also manage on behalf of **water and sewerage undertakers** surface water drains leading to rivers and watercourses and the pipe networks carrying sewage to sewage treatment works.

British Waterways are responsible for navigation on the Lee and Stort Navigations and on the relevant canals (i.e. Hertford Union, Limehouse Cut and Grand Union Canal). The **Port of London Authority** are responsible for navigation on the lowest reaches of the River Lee.

The responsibilities of the above organisations are described further below. The activities of the NRA are then described in detail.

Water and Sewerage Undertakers

These private companies are responsible for providing water supplies and the management of sewage treatment works. Thames Water Utilities and Three Valleys Water Company both provide services to the catchment area.

Her Majesty's Inspectorate of Pollution (HMIP)

HMIP is the regulatory authority for Integrated Pollution Control. This is a system introduced to control pollution from industrial processes which could cause significant pollution to air, land or water. Discharges from sewage treatment works and other discharges to water are regulated by the NRA.

Drinking Water Inspectorate (DWI)

The DWI is responsible for checking that companies supplying drinking water carry out proper monitoring and meet the regulations for the quality of water supplies set in part by the European Community Drinking Water Directive.

Office of Water Services (OFWAT)

A government agency responsible for making sure that the water and sewerage undertakers provide customers with a good quality and efficient service at a fair price.

District or Borough Councils

These authorities monitor the quality of all water supplies, including private supplies, within their area. They can require improvements to be made to private water supplies.

Watercourses which have not been statutorily designated as "main river" on maps held by the NRA and Ministry of Agriculture, Fisheries and Food (MAFF) are known as "ordinary watercourses". The provision of flood defence and land drainage services on these watercourses is the responsibility of the relevant council.

British Waterways (BW)

Created by the Transport Act 1962 BW is the largest navigation authority in the country. The Lee and Stort Navigations are run by BW (Southern Region). Their mission statement is; 'Our business is to manage the inland waterways system efficiently for the increasing benefit of the United Kingdom. We provide a safe and high quality environment for users, staff and local communities. We take a commercial approach and aim for excellence in every aspect of our work. The heritage and environment of our waterways will be conserved, improved and made to work well for future generations'.

Port of London Authority (PLA)

As a public trust, the PLA is required to run the Port of London for the benefit of port users and the community as a whole. It is a non-profit making body and is wholly self-financing. It receives no Government subsidy and has no equity capital, but funds all its operations from its reserves, supplemented as necessary by commercial loans and leasing.

National Rivers Authority (NRA)

Our Mission Statement (printed on the inside of the front cover) is supported by the following aims:

- *To achieve a continuing overall improvement in the quality of rivers, estuaries, and coastal waters, through the control of pollution.*
- *To manage water resources to achieve the right balance between the needs of the environment and those of the abstractors.*
- *To provide effective defence for people and property against flooding from rivers and the sea.*
- *To provide adequate arrangements for flood forecasting and warning.*
- *To maintain, improve and develop fisheries.*
- *To develop the amenity and recreational potential of inland and coastal waters and associated lands.*
- *To conserve and enhance wildlife, landscape, and archaeological features associated with inland and coastal waters of England and Wales.*
- *To improve and maintain inland waters and their facilities for use by the public where the NRA is the navigation authority.*
- *To ensure that discharges pay the costs of the consequences of their discharges, and, as far as possible, recover the costs of water environment improvements from those who benefit.*
- *To improve public understanding of the water environment and the NRA's work.*
- *To improve efficiency in the exercise of the NRA's functions and to provide challenge and opportunity for employees and show concern for their welfare.*

Strategic Objectives

Corporate Strategy

The NRA's vision is of a healthy and diverse water environment, managed in an environmentally sustainable way, balancing the needs of all users.

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

Sustainable development must embrace environmental, social and economic concerns for it to be a workable concept; our challenge is to apply it to the water environment. The NRA Corporate Strategy relates the principles of sustainability, precaution and economic efficiency to our Mission to protect and improve rivers and coastal waters.

To achieve our Mission we apply three principles:

- *making real improvements to the water environment through effective local operations*
- *integrating our services to balance the needs of water users with those of the environment*
- *providing value for money through economic efficiency and effective use of our resources.*

We are guided by three core values which we use as a template by which we can judge our actions:

- *achievement of results*
- *teamwork*
- *trust.*

Our functional strategic objectives for water resources, water quality, conservation, recreation, flood defence, navigation and land use planning are described later. These express how we achieve our Mission and Aims. They follow a logical cycle of planning, action and subsequent review.

- | | |
|---------------|---|
| Plan | <ul style="list-style-type: none"> • To plan for environmental sustainable improvement through an integrated approach to river catchment management. |
| Act | <ul style="list-style-type: none"> • To protect and regulate the water environment and its various uses by achieving agreed standards and objectives. • To identify and ensure implementation of balanced, lasting and cost-effective solutions to environmental problems. • To provide customers with advice, information and incentive to influence behaviour and mitigate or prevent environmental damage. • To use collaboration, partnership and consultation with others to further NRA objectives and make best use of available resource. |
| Review | <ul style="list-style-type: none"> • To assess and report on the state of the water environment and our success in ensuring its sustainable use. |

Water Resources

It is the NRA's responsibility to assess, manage, plan and conserve water resources. The Water Resources Act 1991 describes the duty of the NRA to be to ensure measures are taken towards conservation, redistribution, augmentation and proper use of water resources. The Act requires the NRA to make arrangements with water and sewerage undertakers and statutory water companies for securing proper management and operation of water resources and associated works. To effect these requirements the NRA controls abstractions by a licensing system and has the power, if necessary, to issue drought orders and designate water protection zones and nitrate sensitive areas.

Under the Water Resources Act 1991 all abstractions require a licence except for those of less than 20 cubic metres a day for domestic or agricultural use from surface water and those of less than 20 cubic metres per day for domestic use. There are also other exceptions for small abstractions from boreholes and springs. Charges for abstraction licences are based upon quantity, source, season and loss.

To secure proper management of water resources the NRA operates a hydrometric network of rainfall and river flow gauging stations. These not only provide data for water resource assessment but also for flood prediction, impact of effluent discharges, fisheries management, conservation and recreational uses.

Our Strategic Objectives are:

- To plan for the sustainable development of water resources, developing criteria to assess reasonable needs of abstractors and of the environment.
- To collect, validate, store and provide hydrometric data and water environmental data in order to assess water resources.
- To apply a nationally consistent approach to abstraction licensing, including licence determination, charging, policing and enforcement.
- To implement a consistent approach to the resolution of inherited problems caused by authorised over-abstraction.
- To work with other functions and external bodies to protect the quality of our water resources.

Water Quality

The aim of the NRA is to maintain and improve the quality of rivers, estuaries, coastal waters and groundwater through the control of water pollution. These aims are fulfilled via:

- water quality management
- effluent quality regulation
- pollution incident investigation and
- pollution prevention.

Water quality management is based principally on monitoring of the environment to establish chemical, biological and microbiological quality. These data are used by the NRA to detect trends, plan improvements and execute its statutory duties regarding the setting of discharge parameters and compliance with EC directives.

The NRA controls inputs into the environment via the issue of consents. Discharges from industrial, agricultural, domestic and sewage related sources are regulated by specification of effluent quality limits and conditions which the discharger must achieve. Such discharges are routinely monitored and failure to satisfy consent conditions may lead to legal action being taken.

The NRA makes an immediate response to all reports of pollution. During a pollution incident investigation actions are taken to identify the source, stop the discharge, minimise adverse effects and ensure remedial work where appropriate is completed. Legal action is considered in cases of serious and/or repeated incidents.

Pollution prevention via development control and advice on best practice to industry, farmers, water supply and sewage companies is carried out in support of water quality management to prevent deterioration of the water environment.

Our Strategic Objectives are:

- . To maintain waters that are already of high quality.
- . To improve waters of poorer quality.
- . To ensure all waters are of an appropriate quality for their agreed uses.
- . To prosecute polluters and recover the costs of restoration from them.
- . To devise charging regimes that allocate the costs of maintaining and improving water quality fairly and provide incentive to reduce pollution.

Conservation

Conservation activities of the NRA aim to:

- conserve and enhance the wildlife, landscapes and archaeological features associated with inland and coastal waters
- promote the conservation of aquatic flora and fauna.

The statutory duties under the 1991 Water Resources Act further state that the NRA shall further the conservation and enhancement of natural beauty in respect of proposals relating to NRA functions, protect sites of conservation interest and take into account the effects that any proposals would have. This is achieved through regulating the work of others through the land use planning consultation process and the issuing of consents under the Land Drainage Act 1991 and Water Resources Act 1991 for works adjacent to rivers. The NRA also carries out a programme of conservation works using its own workforce, in addition to assessing the conservation implications of other functional activities.

Our Strategic Objectives are:

- Assess and monitor the conservation status of inland and coastal waters and associated lands.
- Ensure that the NRA's regulatory, operational and advisory activities take full account of the need to sustain and further conservation.
- Promote conservation to enhance the quality of the aquatic and related environment for the benefit of wildlife and people.

Recreation

The NRA has statutory duties to:

- ensure that water and land under the NRA's control is made available for recreational purposes
- promote the use of inland and coastal waters, and land associated with them, for the purpose of recreation.

Recreation and amenity includes provision for opportunities and facilities for sports associated with water and the surrounding land, passive activities around water including public access and rights of way and the general aesthetic quality of the water environment.

These duties are identified in the 1991 Water Resources Act in addition to a Code of Practice which gives guidance on the kinds of provision required and the need to consider collaborative management with other bodies.

In addition to these recreation and amenity considerations the NRA, where it is the authority, has responsibilities towards the maintenance and improvement of waterways for navigation.

Our Strategic Objectives are:

- Maintain, develop and improve recreational use of NRA sites.
- To take account of recreation in proposals relating to any NRA function.
- Promote the use of water and associated land for recreational purposes.

Fisheries

The general fisheries duties of the NRA are set out in the Water Resources Act 1991. Under this Act the NRA is responsible for the regulation of fisheries through the application of orders, byelaws and licensing systems.

An essential feature of the Water Resources Act 1991 is the statutory duty placed on the NRA to "maintain, improve and develop fisheries". The term "fisheries" encompasses both sport fisheries and commercial fisheries, however the Act extends further to effectively cover all inland waters, other than fish farms, which are regulated by the Ministry of Agriculture, Fisheries and Food, which have the capacity to support fish. Sport fisheries include waters such as rivers, streams, canals, lakes, ponds and reservoirs.

To discharge its statutory duties the NRA undertakes a wide range of fish surveillance and monitoring activities. Fish populations are biological indicators of changes in river flow, quality and habitat. The regulation of fish introductions and fish capture are important activities.

The costs of the fisheries service are met, in part, by funds raised from rod licences.

Strategic Objectives:

- Protect and conserve salmon, trout, freshwater, eel and, where appropriate, coastal fisheries.
- Regulate fisheries through the enforcement of a consistent series of licences, orders, byelaws and consents.
- Monitor the fisheries status of rivers and inland estuaries and, where appropriate, coastal waters.
- Formulate policies to maintain, improve and develop fisheries and restore and rehabilitate damaged fisheries.
- Provide an efficient and effective fisheries service which is responsive to the needs of its customers and which is based on a sound charging system.

Flood Defence

The NRA has powers to:

- protect people and property against flooding from rivers and the sea
- provide a means for the drainage of land
- provide adequate arrangements for flood forecasting and warning.

Certain watercourses are designated as "main river". On main rivers the NRA have permissive powers to: construct new defences; maintain defences; and, control the actions of others so that the risk to existing and future uses (eg development) can be minimised. The NRA are the primary group involved in flood defence matters but on ordinary rivers District or Borough Councils are the first point of contact. For flooding from sewers the responsible group is either the District or Borough Council or Thames Water Utilities.

The standard of flood protection can be measured in terms of the frequency at which (eg 1 in 50 years), on average, it will prove ineffective. The standards considered appropriate vary according to the land use to be protected and the economics of providing the service.

These activities are undertaken under the 1991 Water Resources Act and are directed by the Regional Flood Defence Committee. In addition to works on statutory main river, the NRA also has powers to control weirs and culverts on ordinary watercourses that would otherwise affect the flow.

Our Strategic Objectives are:

- To develop and implement our flood defence strategy through a systematic approach for assessing capital and maintenance requirements and develop medium and long-term plans for those defences owned and maintained by the NRA.
- To encourage development of information technology and extension of facilities which will further improve the procedures for warning of, and responding to, emergencies.
- To support R&D which will assist in identifying future flood defence needs.
- To review best practices for all operational methods, and the identification and justification of work, thus increasing efficiency and enhancing value for money.
- To heighten general awareness of the need to control development in flood plains and contribute to the development of catchment management plans.
- To identify opportunities for the enhancement of environmental, recreational and amenity facilities when undertaking flood defence works.

Navigation

Our future strategy is to take a lead in working with other navigation authorities (eg British Waterways) to bring about a more consistent approach to the administration of navigation in inland waters than currently exists in England and Wales, and to facilitate and regulate the use of those inland navigations for which the NRA is navigation authority or has powers, and to manage the inter-relationship of navigation with other core functions of the NRA.

Our Strategic Objectives are:

- Contribute to the development of an overall navigation strategy for England and Wales.
- Regulate NRA navigations through the enforcement of a consistent series of licences, orders, byelaws and statutes.
- Maintain and improve NRA navigation fairway, facilities and standards.
- Recover from users the costs of providing specific navigation facilities and a reasonable proportion of the costs of maintaining the navigation.

Land Use Planning

The NRA is a statutory consultee of the land use planning system and seeks to ensure that local authorities take into account the needs of the water environment when preparing development plans and determining planning applications. A close working relationship is required with both County, District and Borough Councils on mineral workings, waste disposal issues, infrastructure works, works within river corridors or floodplain, and any activities likely to pollute surface or groundwaters or increase the demand for water resources.

Guidance notes for local planning authorities on the methods of protecting the water environment through development plans have been produced (December 1993), and these are being promoted in conjunction with the initiative to prepare Catchment Management Plans.

Summary

Further details on the work of the NRA can be found in a series of NRA strategy documents covering: corporate strategy water quality; water resources; flood defence; fisheries; conservation; navigation; recreation; and, research and development. These documents are available from the NRA Corporate Planning section at our head office at Rivers House, Waterside Drive, Aztec West, Almondsbury, Bristol BS12 44D.

During July 1994, a number of organisations with an interest in the water environment of the catchment were contacted. These included: Country, district and parish Councils; Government departments and statutory bodies; organisations and interest groups; industry; and landowners and angling interests. As a result of the initial contact, a number of meetings were held.

The purpose of this period of informal external liaison was to secure relevant information and appreciation of the issues related to the water environment concerning those associated with the area from as wide a range of local people, interest groups and statutory bodies as possible. This period of informal liaison was not intended to be a substitute for the planned period of formal consultation. It enabled the NRA, however, to review a wide range of activities relevant to the natural water environment before identifying the key issues we and others need to tackle.

The response rate overall was 17% with the level of response varying in consultee groupings, see Table 10 below for details.

TABLE 10: RESPONSES TO INFORMAL CONSULTATION

Consultee Group	Number Contacted	Number Responding	% Response
A. County and District Councils	9	9	100
B. Parish Councils	63	14	22
C. Government Depts and Statutory bodies	20	8	40
D. Organisations and Interest Groups	42	12	29
E. Industry	6	1	17
F. Landowners and Angling Interests	5	1	20
Total	145	45	31

Although this is quite a small percent response rate, this may reflect the greater number of consultees approached than in previous informal consultation procedures. It is hoped that those consultees with any significant concerns would have responded as part of the 17%, suggesting that other consultees have no particular issues to raise with regards to this catchment at the moment, although they will be contacted in the future to comment at the formal Consultation Report stage of this plan.

As a result of these responses, it was possible to identify a number of recurring concerns:

- Conservation including promotion of the conservation of flora and fauna, and biodiversity.
- Accessibility of the water environment to the public and for navigation purposes.
- Water quality in terms of leisure activities and wildlife.
- Flow levels of the river including up-stream abstraction, navigational requirements, keeping archaeological sites water logged to preserve known artifacts, and flood relief.

Despite the low response rate from the councils, it was possible to identify specific issues of concern. These were mainly connected with the quality of water and the need to improve habitat for wildlife and facilities for leisure activities. The Councils also expressed a concern that the watercourse and surrounding environment should be accessible for the public. This view was also expressed by a number of statutory bodies.

The statutory bodies identified the preservation of archaeological sites as a key issue which needed to be included in the Catchment Management Plan as the sites could be disturbed if their surrounding environment was altered, i.e. were no longer water logged or the earth was moved to alter the watercourse in any way.

The organisations and interest groups that responded were concerned mainly with the conservation aspects of the Catchment Management Plan. The identified issues relating to this area included concerns on the impact that flood prevention works would have on the wildlife and river levels. Also, how the quality of water would affect amenity use and wildlife. The promotion, enhancement and maintenance of the river's biodiversity was also expressed as an important issue. The accessibility of water environment in terms of safe towpaths, was cited as an important issue by the London Cycling Campaign.

On the whole, it would appear that the main concerns are those relating to the conservation of the water environment. The preservation and enhancement of the biodiversity linked to the river and, as a prerequisite of that, the quality of the water. The majority of consultees expressed concern that the Catchment Management Plan should enhance the accessibility of the river environment, not only for navigation, but also along the river corridors.

TABLE 11: BIOLOGICAL MONITORING RESULTS

WATERCOURSE/SITE (NGR)	Mean BMWP Score (Diversity measure)				Mean ASPT score (Water quality measure)			
	74-79	80-84	85-89	90-94	74-79	80-84	85-84	90-94
Ching Brook Below Cavendish, Highams Pk (TQ380 915)	-	-	-	36	-	-	-	3.3
Cobbins Brook Cobbins Bridge, Epping Upland (TL447 380)	-	49	37	-	-	4.9	4.1	-
Fernhall Lane (TL 418 266)	-	34	46	-	-	4.2	3.7	-
Above Reevesgate Brook (TL412 210)	-	-	-	26	-	-	-	3.3
Above Breach Barns Ditch (TL405 088)	-	-	44	-	-	-	3.7	-
Above Paternoster Hill (TL394 110)	-	16	14	30	-	2.9	2.6	3.3
Commill Stream Commill Meadows (TL382 012)	-	-	-	105	-	-	-	4.0
Below Leverton Way (TL381 050)	-	-	76	-	-	-	4.2	-
Cuffley Brook Home Wood, Cuffley (TL298 430)	-	-	-	33	-	-	-	3.7
Whitewebbs Road, Crews Hill (TQ319 999)	-	24	24	37	-	-	4.0	3.5
Whitewebbs Golf Course (TQ328 990)	-	-	-	64	-	-	-	3.8
Dagenham Brook Marsh Lane (TQ371 870)	-	-	-	15	-	-	-	2.5
Friary Park Stream Friary Park, Friern Barnet (TQ272 927)	-	-	-	39	-	-	-	3.3
Green Brook Above Pymmes Brook, Hadley Wood (TQ273 975)	-	-	-	55	-	-	-	3.9
Grovelands Park Stream Below Grovelands Park Lake (TW309 945)	-	-	-	28	-	-	-	3.1
Hempshill Brook Northaw Road (TL300 019)	-	-	-	35	-	-	-	3.9
Hounsden Gutter Hounsden Road, Enfield (TQ312 952)	-	-	-	12	-	-	-	2.4
Deepdene Court (TQ318 953)	-	-	-	21	-	-	-	2.6
River Lee (Excluding navigable river) Below Kings Weir (TL373 043)	101	115	128	176	4.8	4.9	5.0	5.3
(Sub A) Below Enfield Weir (TQ373 988)	53	98	95	152	3.8	4.7	4.5	5.0
At Hackney Marshes (TQ366 865)	43	41	27	47	3.3	3.7	3.3	3.4
Below Carpenters Road (TQ377 845)	-	-	-	33	-	-	-	3.0
Lee Flood Relief Channel LFRC (Nazeing) Above Nazeing Brook (TL380 059)	-	-	119	-	-	-	5.2	-
LFRC (Cattlegate) at Cattlegate (TQ377 982)	-	-	-	106	5.1	-	-	4.5
LFRC At Lee Valley Road (TQ375 949)	86	-	-	95	-	-	-	4.4

TABLE 11: BIOLOGICAL MONITORING RESULTS

WATERCOURSE/SITE (NGR)	Mean BMWP Score (Diversity measure)				Mean ASPT score (Water quality measure)			
	74-79	80-84	85-89	90-94	74-79	80-84	85-89	90-94
Lee Navigation & Navigable Lee								
At Rye House Inlet (TL390 090)	56	118	-	144	4.9	5.1	-	4.9
Above Dobbs Weir (TL385 682)	-	-	-	95	-	-	-	4.3
	-	-	-	101	-	-	-	4.8
Above Aqueduct Lock (TL373 046)	54	107	113	128	4.4	5.3	4.5	4.8
Above Walham Town Lock (TL374 007)	-	53	-	76	-	3.7	-	4.0
Above Keides Weir (TQ365 957)	-	-	-	30	-	-	-	3.1
At Springhill (TQ348 876)	11	27	27	26	2.4	3.0	3.4	3.3
At Lee Bridge Weir (TQ 357 866)	-	-	-	66	-	-	-	4.1
Above Old Ford Lock (TQ373 840)	-	-	-	-	-	-	-	-
Leeging Beech Gutter	-	-	-	74	-	-	-	4.1
Trent Country Park (TQ296 975)	-	-	-	-	-	-	-	-
Merryhills Brook	-	-	33	52	-	-	4.1	4.0
Snakes Lane, Trent Park (TQ290 966)	-	-	46	51	-	-	5.8	3.6
Above Salmon Brook (TQ309 969)	-	-	-	-	-	-	-	-
Monken Mead Brook	-	-	-	67	-	-	-	4.5
Above Burtrams Lane, Hadley (TQ261 983)	-	-	-	43	-	-	-	3.6
Kingswell Road, Hadley Wood (TQ273 985)	-	-	-	-	-	-	-	-
Moselle Brook	-	-	-	15	-	-	-	2.5
Tottenham Cemetery (TQ331 912)	-	-	-	-	-	-	-	-
Nazeing Brook	-	-	69	-	-	-	4.6	-
Above Nurseries, Nazeing (TL 403 062)	-	-	-	-	-	-	-	-
New Cut	-	-	-	98	-	-	-	4.1
r/o Stonebridge Lock (TQ352 907)	-	-	-	-	-	-	-	-
New River	-	-	-	85	-	-	-	4.5
Bullsmoor Lane (TQ347 996)	-	-	-	-	-	-	-	-
Northaw Brook	-	-	-	59	-	-	-	3.9
Cattlegate Road (TL298 015)	-	-	-	-	-	-	-	-
Old River Lee	-	-	-	78	-	-	-	4.1
Powdermill Lane (TL379 008)	-	-	-	-	-	-	-	-
Pymmes Brook	-	-	-	104	-	-	-	4.3
Below Jacks Lake (TQ271 969)	-	-	29	41	-	-	3.2	3.4
At Park Road (TQ269 964)	-	-	32	18	-	-	3.2	3.0
Oakhill Park (TQ276 949)	-	-	15	18	-	-	3.0	3.0
At Arnos Park (TQ295 927)	-	15	15	29	-	2.5	2.5	3.0
At Pymmes Park (TQ338 925)	-	-	12	24	-	-	2.4	2.9
At Tottenham Hale (TQ347 895)	-	-	-	-	-	-	-	-
Salmons Brook	-	-	-	54	-	-	-	4.9
Below Spoilbank Wood (TQ266 989)	-	-	-	55	-	-	-	4.0
At Roundhedge Hill (TQ284 988)	-	-	29	50	-	-	3.2	4.0
Hadley Road, Enfield (TQ302 980)	-	-	-	89	-	-	-	4.2
Above A110, Enfield (TQ310 969)	-	-	-	103	-	-	-	4.3
Enfield Golf Course (TQ315 964)	-	-	-	72	-	-	-	4.0
Little Bury Street (TQ331 946)	-	-	-	32	-	-	-	3.4
Above Montagu Road (TQ353 932)	-	34	17	32	-	3.4	2.7	3.2
Above Deephams STW (TQ355 935)	-	34	13	30	-	3.4	2.6	3.2
Below Deephams STW (TQ356 930)	-	-	-	-	-	-	-	-
Small River Lee	-	-	-	87	-	-	-	4.4
Cheshunt Marshes (TL370 009)	-	-	87	101	-	-	4.2	4.4
High Bridge Street (TL371 040)	-	-	54	76	-	-	3.6	3.9
Above Turkey Brook (TL370 987)	-	62	84	-	-	3.9	4.2	-
Below Turkey Brook (TQ368 982)	-	-	-	-	-	-	-	-
Strawberry Vale Brook	-	-	-	15	-	-	-	2.5
Seaford Road (TQ307 921)	-	-	-	-	-	-	-	-
Theobalds Brook	-	-	-	75	-	-	-	5.0
Theobalds Lane (TL355 013)	-	-	-	-	-	-	-	-
Turkey Brook	-	-	21	37	-	-	3.0	3.7
Below M25, Crews Hill (TL304 004)	-	-	26	54	-	-	3.2	3.7
Hillyfields Park (TQ318 985)	-	-	44	95	-	-	3.7	4.5
Maidens Bridge, Forty Hall (TQ342 988)	-	-	-	67	-	-	-	3.9
Gilbert Street (TQ354 988)	-	-	-	81	-	-	-	3.9
Above Small River Lee (TQ366 984)	-	-	-	-	-	-	-	-
Victoria Watercourse	-	-	-	15	-	-	-	2.5
At Recreation Ground (TQ268 964)	-	-	-	-	-	-	-	-

APPENDIX III

SUPPORTING INFORMATION

TABLE 12: BACTERIOLOGICAL DATA

SITE (Down Survey)	NCR	T.C.	1st Quarter F.C.	T.C.	2nd Quarter F.C.	T.C.	3rd Quarter F.C.	T.C.	4th Quarter F.C.	Composite mean F.C.
Byr Illece Dobbs Weir Kear Weir High Bridge St. W. Abbey Eastfield Lock Keddes Weir via Tottenham Locks via Pyramus Brook Springhill Lea Bridge Weir Carpenters Road Three Mills Lane	TL 3858 0990 TL 3858 0990 TL 3710 0570 TL 3755 0055 TO 3710 9805 TO 3610 9510 TO 3674 8953 TO 3475 8915 TO 3480 8766 TO 3570 8466 TO 3710 8450 TO 3810 8280	1800 26000 1800 1009 500 5000 1000 10000 30000 10000 20000 20000	140 1400 700 100 20 900 100 13000 6000 6000 2000 1000	100 12000 6000 300 100 2000 300 80000 180000 40000 2000	10 1300 300 70 4 100 5 5000 5000 3000 300	220 5000 1000 1200 700 200 3300 450000 470000 310000 57000 5400	7 600 130 180 90 50 200 35000 22000 21000 6000 210	100 320000 1300 700 2400 4000 1700 40000 12000 12000 5000 2200	50 35000 700 140 220 220 210 15000 12000 11000 14000 1100	31 2486 371 115 35 199 87 13812 11872 13200 1250 508
Pyramus Brook Cal Hill Oxide Lane via Rosedale Green Brook Stambridge Vale Brook Lillingdon Cemetery Rosedale Green Brook via Pyramus Brook Merridale Stream via Pyramus Brook Merridale Brook Crews Lane Lordskip Rec. Ground White Hart Lane Stambridge Brook via Lea Navigation Dunham Brook via Lea Navigation	TQ 2778 9541 TQ 2840 9421 TQ 2978 9265 TQ 2759 9117 TQ 2982 9251 TQ 3108 9218 TQ 3062 8963 TQ 3242 9009 TQ 3361 9132 TQ 3411 8876 TQ 3708 8696	530000 275000 135000 430000 315000 870000 1000000 50000 350000 1000000 330000	39000 26000 16000 63000 62000 230000 440000 5000 30000 700000 44000	970000 108888 44000 113000 44000 117000 880000 > 1000000 230000 > 1000000	31000 13700 12600 38000 14000 41000 210000 77000 38000 900000	900000 240000 84000 50000 97000 57000 > 1500000 360000 330000 > 1500000	400000 100700 23000 14000 190000 28000 560000 61000 90000 1050000	380000 119000 32000 80000 220000 610000 > 1500000 180000 3600 800000	90000 113000 90000 80000 96000 630000 > 1000000 20000 5900 94000	81223 44869 14292 40465 63079 113567 476941 40972 61384 257300

Notes: 1) T.C. = Presumptive Total coliforms/100 ml
2) F.C. = Faecal coliforms/100 ml (Presumptive Escherichia coli/100 ml)
NCR = National Grid Reference

TABLE 13: RIVER ECOSYSTEM CLASSIFICATION: WATER QUALITY CRITERIA

Class	Dissolved Oxygen % saturation 10 percentile	BOD (ATU) mg/l 90 percentile	Total Ammonia mg N/l 90 percentile	Un-ionised Ammonia mg N/l 95 percentile	ph lower limit as 5 percentile: upper limit as 95 percentile	Hardness mg/l Ca CO ₃ 95 percentile	Dissolved Copper pg/l 95 percentile	Total Zinc pg/l 95 percentile
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
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
RE3	60	6.0	1.3	0.021	6.0 - 9.0	≤ 10 > 10 and ≤ 50 > 50 and ≤ 100 > 100	5 22 40 112	300 700 1000 2000
RE4	50	8.0	2.5	-	6.0 - 9.0	≤ 10 > 10 and ≤ 50 > 50 and ≤ 100 > 100	5 22 40 112	300 700 1000 2000
RE5	20	15.0	9.0	-	-	-	-	-

TABLE 14: GENERAL QUALITY ASSESSMENT: CHEMICAL GRADING FOR RIVERS AND CANALS

Water Quality	Grade	Dissolved Oxygen	Biochemical Oxygen Demand (ATU ¹)	Ammonia
		(% saturation) 10 percentile	(mg/l) 90 percentile	mgH/l) 90 percentile
Good	A	80	2.5	0.25
Fair	B	70	4	0.6
	C	60	6	1.3
Poor	D	50	8	2.5
Bad	E	20	15	9.0
	F ²	-	-	-

¹ as suppressed by adding allyl thio-urea

² ie quality which does not meet the requirements of grade E in respect of one or more determinands

POLLUTION INCIDENT Categories**MAJOR**

A major incident involving one or more of the following:

- a) potential or actual persistent effect on water quality or aquatic life;
- b) closure of potable water, industrial or agricultural abstraction necessary;
- c) extensive fish kill;
- d) excessive breaches of consent conditions;
- e) extensive remedial measures necessary;
- f) major effect on amenity value.

SIGNIFICANT

- a) notification to abstractors necessary;
- b) significant fish kill;
- c) measurable effect on invertebrate life;
- d) water unfit for stock;
- e) bed of watercourse contaminated;
- f) amenity value to the public, owners or users reduced by odour or appearance;
- g) breach of consent conditions

MINOR

Minor suspected or probable pollution which, on investigation, proves unlikely to be capable of substantiation or to have no notable effect.

NRA POLICY STATEMENTS ON LICENSING ABSTRACTIONS**Introduction**

The abstraction of water is controlled by the Water Resources Act 1991. This summary presents the key policy statements contained in the General Statement on Licensing Abstraction in the Thames Region. These policies are currently being applied to all new applications for licences or variations. They are not being applied retrospectively to existing licences as such action would render the NRA liable for compensation.

Consumptive Abstractions from Inland Waters (Rivers, Streams, Lakes, Ponds, etc..)

Policy G1. No licences will be granted allowing the unconstrained abstraction of water in the summer months (April to October) for a consumptive use from an inland water except in cases which can be continuously monitored and with a condition prohibiting abstraction at times when river flows are below a prescribed flow.

Policy G2. Winter abstractions from an inland water will normally be allowed but will also contain a prescribed flow condition.

Consumptive Abstractions from Underground Strata (Aquifers)

Consumptive Abstractions from Confined Aquifers **Policy G3.** Licences may be granted if the aquifer is full to the base of the overlying clay, and groundwater levels do not show an unacceptable trend of long-term decline. As water levels in this type of aquifer fluctuate rapidly in response to pumping all licences will be time limited to review dates at 5 or 10 year intervals and some may be subject to control by a prescribed groundwater level.

Consumptive Abstractions from Unconfined Aquifers **Policy G4.** Within 250m of a perennial, groundwater-fed stretch of river, or within its main flood plain, whichever is the greater, consumptive ground water abstractions will be treated as abstractions from a river (See G.2 above).

Policy G5. Beyond the limits in Policy G4, consumptive groundwater abstractions may be allowed, providing the level of resource utilisation permits, but they will generally be subject to control by prescribed river flow or, less commonly, by prescribed groundwater level.

In some cases some reservoir storage will be required to make such abstractions fully reliable.

Non Consumptive Abstractions

Policy G6. Where a very high proportion (95% or more) of the water taken is returned to the source of supply upstream of or immediately downstream of the point of abstraction a licence will normally be granted provided that any by-passed stretch of channel is adequately protected against low flows.

Very Small Abstractions ('De Minimus')

Policy G7. Very small abstractions for general agriculture and private water undertaking uses, will normally be allowed without constraint of a prescribed flow, a prescribed level or a time limit. The cut off limits for an individual abstraction for these concessions will normally be 5000 cu.m (1.1 million gallons) per year and 20 cu.m (4,400) gallons per day.

NRA POLICY STATEMENTS ON LICENSING ABSTRACTIONS (Continued)**Abstractions for Sprav Irrigation**

Policy G8. Spray irrigation abstractions from rivers will not be permitted in summer (April to October) but will normally be permitted in Winter with a prescribed flow constraint to protect low winter flows. Reservoir storage for the full annual volume will be required.

Policy G9. Spray irrigation abstractions from groundwater may be permitted in some circumstances, generally in accordance with normal policies on consumptive groundwater abstractions. The imposition of a prescribed flow or a prescribed level may require some reservoir storage but this is optional on the applicant.

Policy G10. For non-agricultural uses (eg golf courses) groundwater licences for direct spray irrigation will include a further restriction on use when restrictions on public water supply are in force.

Abstractions from the Tideway of the River Thames

Policy G11. Abstractions from the tideway of the River Thames will normally be permitted providing there is no conflict with water quality and fisheries.

Appeal. All the statements above are subject to the right of the applicant to appeal to the Secretary of State for the Environment against a refusal by the NRA to grant a licence or against any of the terms of a licence.

AMP	- Asset Management Plan
AOD	- Above Ordnance Datum
AONB	- Area of Outstanding Natural Beauty as designed by the Countryside Commission
AQUIFER	- A layer of underground porous rock which contains water and allows water to flow through it
ASPT	- Average Species Per Taxa
BC	- Borough Council
BMWP	- Biological Monitoring Working Party
BOD	- Biochemical Oxygen Demand - a measure of the amount of oxygen required to breakdown all organic material in a water body.
BW	- British Waterways
CC	- County Council
CMP	- Catchment Management Plan
CONSENT	- The statutory document issued by NRA under schedule 10 of the Water Resources Act 1991 to indicate any limits and conditions on the discharge of an effluent to a controlled water.
CSO	- Combined Sewer Overflows, sewers which carry both surface and foul water need overflow facilities into rivers for heavy storms.
CULVERT	- Barging a river underground in a pipe.
CYPRINID	- Coarse fish of the Carp family i.e. roach, dace, bream
DC	- District Council
DIRECTIVE	- A type of legislation issued by the European Community which is binding on the member states
DoE	- Department of the Environment
DO	- Dissolved Oxygen
DWI	- Drinking Water Inspectorate
E. COLI	- Escherichia Coli
EC	- European Commission
ECC	- Essex County Council
ECSR	- Eastern Council for Sports and Recreation
ENVIRONMENTAL	
CAPACITY	- The point at which development passes from being sustainable to unsustainable
EUTROPHIC	- Water with very high nutrient levels
EQI	- Ecological Quality Index
FAUNA	- Animals, birds, insects
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	- Plants
GQA	- General Quality Assessment
GROUNDWATER	
	- Underground water contained in the pores and fissures of aquifers (water bearing strata)
HMIP	- Her Majesty's Inspectorate of Pollution
HYPERTROPHIC	
	- Water with nutrient levels even higher than eutrophic
LB	- London Borough
LFRC	- River Lee Flood Relief Channel
LOCAL	
PLAN	- Statutory plan to shape development within each district outside London
LVRPA	- Lee Valley Regional Park Authority
MAFF	- Ministry of Agriculture, Fisheries and Food
MISCONNECTION	- Connected foul water pipes to the surface water sewer
MOD	- Ministry of Defence
MPPA	- Million Persons Per Annum

MRL	- Main River Limit	NCZ	- Nature Conservation Zone
NGR	- National Grid Reference		
NRA	- National Rivers Authority		
NRA TR	- National Rivers Authority Thames Region		
NVZ	- Nitrate Vulnerable Zone		
NWC	- National Water Council		
OFWAT	- Office of Water Services		
PLA	- Port of London Authority		
PWQO	- Provisional Water Quality Objectives		
Q95	- Flows exceeded for 90% of the time		
RE	- River Ecosystem		
RIPARIAN			
OWNER	- A person/organisation with property rights on a river bank		
RQO	- River Quality Objective		
SALMONIDS			
	- Fish classified as belonging to the Salmon family ie salmon, trout, char etc		
SSSI	- Site of Special Scientific Interest		
STW	- Sewage Treatment Works		
SWQO	- Statutory Water Quality Objective		
TAXA	- Classification of groups of fauna		
TVWS	- Three Valleys Water Services		
TWUL	- Thames Water Utilities Limited		
UDP	- Unitary Development Plan - statutory plan to shape development within each		

Units

Length:	10mm	= 1 cm (equivalent to 0.394 inches)
	100cm	= 1m (equivalent to 39.37 inches)
	1000m	= 1km (equivalent to 0.621 miles)
Area:	10 000 m ²	= 1 ha (equivalent to 2.47 acres)
Flow:	1 000 l/s	= 1 m ³ /s (equivalent to 35.31 cusecs)
	1 000 m ³ /d	= 11.6 l/s (equivalent to 0.41 cusecs)
	1 Ml/d	= 11.6 l/s (equivalent to 0.224 mgd)

Ass. of British Chambers of Commerce
 Barnet Cncl. for Sports and Recreation
 Barnet & District Local History Soc.
 British Agg. & Construction Mat. Ind.
 British Ass. of Chambers of Commerce
 British Naturalist Ass. Essex Branch
 British Rail Property Board
 British Telecom, East Anglia
 British Telecom, Northern London
 British Telecom, S. Midlands & Chilterns
 British Waterways
 Broxbourne Boat Club
 Broxbourne Borough Council
 Broxbourne Centre
 Broxbourne Cruising Club
 Broxbourne Woods Area Cons. Soc.
 CBI London Region
 CBI South East and Southern Region
 CPRE Essex Branch
 CPRE Hertfordshire Branch
 CPRE North London Branch
 Chamber of Trade and Commerce
 Commission for New Towns
 Common Ground
 Commons, Open Spaces Footpaths Soc.
 Confederation of British Ind. (East. Reg.)
 Cons. Trust c/o Environmental Council
 Conservatory of Epping Forest
 Council for the Protect. of Rural England
 Countryside Commission
 Crown Estates Commissioner
 Department of National Heritage
 Dept. of Trade and Industry, S. East
 Dept. of Transport (Highways Agency)
 Department of the Environment
 East Anglia Tourist Board
 East Herts. District Council
 East Herts Archaeological Society
 East London Partnership
 Eastern Electricity Board
 Eastern Enfield Study Group
 Eastern Gas
 Enfield Lock Conservation Group
 Enfield Preservation Society
 English Heritage
 English Nature (Essex Herts & London)
 English Nature, South East Region
 English Tourist Board
 Epping Forest Chamber of Commerce
 Epping Forest District Council

Epping Forest Dist. Sports Council
 Essex Birdwatching & Preservation Society
 Essex Bridleways Ass.
 Essex County Council
 Essex Ecology Services Ltd.
 Essex Field Club
 Essex Naturalists Trust
 Essex Water Company
 Essex Herts & London Narrowboats Farming & Wildlife Advisory Group
 Fed. of Epping Forest Amenity Soc.
 Forestry Auth. (Thames & Chilterns Consv.)
 Forestry Authority (England)
 Forestry Comms. E. England Conservancy
 Friends of the Earth
 Gtr. London Cncl. for Sport & Recreation
 Herts. Archaeological Trust
 Herts. Chamber of Commerce & Industry
 Herts. Conservation Society
 Herts. County Council
 Herts. District Councils Association
 Herts. Federation of Amenity Society
 Herts. Groundwork Trust
 Herts. & Middlesex Wildlife Trust
 Herts. Branch Inland Waterways Ass.
 Herts. Chamber of Commerce & Industry
 Herts. Development Organisation
 Herts. Federation of Amenity Services
 Herts. Young Mariners
 Herts. & N. Middlesex Ramblers Ass.
 House Builders Federation
 H.M. Inspectorate of Pollution
 Inland Waterways Association
 Institute of Fresh Water Ecology
 Laburnum Boat Club
 Lea Valley Narrowboat Co. Ltd
 Lee Valley Anglers Consultative Ass.
 Lee Valley Association
 Lee Valley Regional Park Authority
 Lee and Stort Cruising Club
 London Borough of Barnet
 London Borough of Camden
 London Borough of Enfield
 London Borough of Hackney
 London Borough of Haringey
 London Borough of Islington
 London Borough of Newham
 London Borough of Redbridge
 London Borough of Tower Hamlets
 London Borough of Waltham Forest
 London Cycling Campaign

APPENDIX V - BODIES BEING CONSULTED OVER THIS PLAN

London Docklands Development Org.	Three Valleys Water
London Ecology Unit	UK2000
London Electricity Plc	University of Hertfordshire
London Fire & Civil Def. Auth. (LFCDA)	Waltham Abbey Historical Society
London Green Belt Council	Waltham Forest Chamber of Commerce
London Middx. Archaeological Society	Waltham Forest Environmental Forum
London Natural History Society	Walthamstow Marsh Society
London Planning Advisory Committee	Welwyn Hatfield District Council
London River Authority	West Essex Archaeological Group
London Tourist Board	West Essex Group Ramblers Assoc.
London Waste Regulation Authority	
London Wildlife Trust	
London Cycling Campaign	
Lower Lee Project	
Middx. University Business School	
Min. of Agriculture, Fish. & Food	
Monken Hadley Common Trustees	
Museum of London	
National Association of Boatowners	
National Farmers Union, Herts.	
National Playing Fields Association	
National Trust	
National Trust, Thames/Chilterns Region	
Nazeing Conservation Society	
Newham Chamber of Commerce	
Newham Council	
N.East London Archaeological Officer	
North London Chamber of Commerce	
North Thames Gas	
Open Spaces Society	
Planning Aid for London	
Port of London Properties Ltd.	
Ramblers Association	
Ramblers Association - Essex	
Ramblers Ass. - Herts & North Middx.	
Ramblers Association - London	
Rammy Marsh Cruising Club	
Ridge Parish Council	
River Thames Society	
R.Thames Soc. Lower Tideway Branch	
Royal Comm. - Hist. Mons. of England	
Royal Soc. for the Protection of Birds	
Rural Community Council of Essex	
Salmon & Trout Association	
Sand and Gravel Association	
Serplan	
Soc. for the Protection of Ancient Bldgs.	
Southern Lea Valley Federation	
Sports Council Eastern Region	
Springfield Marina	
Stratford Development Partnership	
Thames Water Utilities Ltd.	
The Community Forum	
The Council for British Archaeology	
The House Builders Federation	
The London Forum of Greater London	