

# BRENT & CRANE CATCHMENT MANAGEMENT PLAN CONSULTATION REPORT



NRA

*National Rivers Authority  
Thames Region*

*December 1995*

**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 business like, efficient and caring towards our employees.*

ENVIRONMENT AGENCY



068633

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# BRENT AND CRANE CATCHMENT MANAGEMENT PLAN - CONSULTATION REPORT

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# **BRENT AND CRANE 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).

## **NOTE**

- (1) 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.
- (2) Information from this report may be freely used provided it is acknowledged.



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## DRAFT CATCHMENT VISION FOR THE BRENT AND CRANE

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The urbanised nature of the Brent and Crane catchments dictates the problems and issues that affect the water environment. Whilst it is unlikely that the balance of land uses will change significantly, future land use management will provide opportunities to enhance the water environment.

At present both the Brent and Crane catchments have predominately poor and fair water quality respectively which affects the ecological and recreational benefit that can be gained from the rivers, streams and canals. It is therefore essential that in order to breathe new life into the catchments, water quality issues should take the highest priority and form the key objective for the catchments.

In trying to solve the problems within the catchments the NRA must have the full support of the community. Without educating and informing the public of our ideas for future management, little practical benefit may ever be achieved.

In order to achieve this plan's vision of a healthy water environment for the Brent and Crane catchments, the following five objectives will need to be tackled:

- *Identify sources of pollution within the catchments and concentrate initial investigations on both the Mutton and Wealdstone Brooks.*
- *Continue to provide adequate flood protection for the public and look at the feasibility of future schemes on the Edgware and Deans Brook.*
- *Promote and enhance recreational opportunities upon the rivers, Grand Union Canal and Brent Reservoir, where it is appropriate to do so.*
- *Seek opportunities to enhance stretches of visually and ecologically degraded river channels and corridors. This is especially relevant to the redevelopment of the Brent Cross Centre and possible development of Heathrow Airport.*
- *Work in partnership with various Local Agenda 21 initiatives and community groups to develop new ideas and initiatives for the future.*

This is a draft catchment vision which will be developed further after the consultation process. The version that will appear in the Action Plan may include targets for achieving these five objectives.

*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 NRA. It describes the Catchment Management Planning process and the purpose of this Consultation Report.*



## 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 has the greatest use and reuse of water of any part of the country. These pressures call for the careful management 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 a first step in the process called *Catchment Management Planning*, initiated by the National Rivers Authority (NRA). It provides a focus for those concerned with the future health of the catchments of the Brent and Crane rivers. A catchment being a discrete geographical unit based on natural surface water drainage areas.

## The NRA Role

Established in 1989, the NRA is the principal agency responsible for safeguarding and improving the water environment in England and Wales, with statutory responsibilities for: water resources, water quality, pollution control, flood defence, fisheries, recreation, conservation and navigation.

The **Environment Agency** will come into being during 1996, drawing together the responsibilities of the NRA, Her Majesty's Inspectorate of Pollution (HMIP) and Waste Regulation Authorities. The Secretary of State for the Environment, John Gummer, has said of the Agency that:

*"It will, first of all need to take an integrated approach to providing effective environmental protection, integrated to take account of impacts on air, water and land and integrated geographically so that interconnected systems such as river catchments are considered as a whole".*

The NRA anticipate that the Catchment Management Planning process will continue to play an important role within the new Environment Agency.

The NRA have placed particular emphasis on planning for environmental sustainability through an integrated approach to river catchment management. Inherent to the success of this approach is the need to work closely with local communities, industry, landowners, interest groups and other agencies whose activities and interests interact with the water environment.

### Sustainable Catchment Management

Environmental sustainability requires development needs to be met without compromising the ability of future generations to meet their own needs. This requires a full consideration of environmental, social and economic issues during the decision making process. This is an approach that has been backed by the Rio Earth Summit, European Union and the UK Government. This is demonstrated by the following extract from Agenda 21 prepared at the Rio Earth Summit in June 1992:

*"By the year 2000 all states should have national action programmes for water management, based on catchment basins or sub-basins, and efficient water-use programmes. These should integrate water resources planning with land use planning and other development and conservation activities, demand management through pricing or regulation, conservation, reuse and recycling of water."*

This theme has been adopted by the UK Government, and is reflected in part by Planning Policy Guidance Note 12 "Development Plans and Regional Guidance" (Department of the Environment (DOE), 1992) which states that:

*"the government has made clear it's intention to work towards ensuring that development and growth are sustainable".*

The recent publication "Thames 21 - A Planning Perspective and a Sustainable Strategy for the Thames Region" (NRA September 1995), sets out a sustainable strategy for the water environment of the Thames Region. "Thames 21" has three roles:

- a bridge between the NRA and external organisations dealing with strategic planning
- an easy to use summary of current NRA policies for promotion through the statutory land use development plan system
- a regional context for the preparation of catchment management plans with an indication of the development issues which these plans will need to address. This will enable them to promote sustainable natural resource management.

"Thames 21" provides guidance on methods for protecting the water environment for each of the NRA's core functional responsibilities, together with a number of principles which the NRA will follow in advancing sustainable development.

One important change in the future management of the Brent and Crane catchments will be the increased opportunity for **community involvement**. It is hoped that local community groups and individuals will be able to take part in all aspects of this process. Greater environmental awareness will also bring with it more responsible citizenship, as people become aware of their choices and the consequences of those choices. However, the NRA cannot act on its own in pursuit of this vision. It requires careful planning, shared responsibility amongst the local community and all relevant agencies, and consensus on our long term objectives.



## STEP 1



The NRA produce a Consultation Report.  
This will include:

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

## STEP 2



From December 1995 to March 1996 organisations, groups and individuals interested in the future of the catchment can make comments to the NRA.

## STEP 3



During spring 1996 there will be discussions between the NRA and groups and individuals over key issues.

## STEP 4



The NRA will produce the Action Plan in June 1996.  
This will include:

- a summary of the catchment's resources, uses and activities
- an agreed vision, strategy and detailed activity plans
- a description of future monitoring activity.

## STEP 7

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

## STEP 6



The NRA will produce a monitoring plan each year.  
This will include:

- an update on the state of the water environment
- progress achieved on the activity plans
- a review of the appropriateness of the Action Plan.

## STEP 5



The NRA and others will work together to implement the activities in the Action Plan.

## STEPS IN THE CMP PROCESS

### **Catchment Management Plans**

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

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

- introduce and explain the new system of statutory water quality objectives (SWQO)
- 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.

This document, the Consultation Report, is the first output from the process and will help us to produce an Action Plan to help deliver our long term vision.

### **The Consultation Report**

A summary of the contents of this Consultation Report is shown on the next page. During the production of this report we have undertaken internal discussions, 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.

The Consultation Report does not seek to establish, in a final form, the vision and guiding policy objectives for managing the catchments. Nor does it define in detail the activities necessary to tackle the key issues for the water environment. Rather, it describes the catchments, reviews the state of the water environment and identifies the potential scope of a subsequent strategy, by including a draft vision (see p.5) and options for tackling the key issues facing the Brent and Crane river catchments (see Section 4). In Sections 2 and 3 of the Consultation Report wherever the text relates to an issue or option presented in Section 4, a cross reference is highlighted in the text.

The potential actions we present in Section 4 will only be finalised and developed into a strategy once we have had an opportunity to review and consider your response to this Consultation Report.



## CONTENTS OF THE CONSULTATION REPORT

### SECTION 1

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 Action Plan

### SECTION 2

We describe the catchment's natural resource, the uses made of the water environment and the activities likely to affect it

### SECTION 3

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

### SECTION 4

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

### 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 help develop a consensus. We are particularly interested to hear your views on the following aspects of the Consultation Report:

- the accuracy of the descriptions of resources, uses and activities in the catchment
- the assessment of issues arising within the catchment
- the way forward for dealing with the key issues
- the draft catchment vision
- the levels and uses for which Statutory Water Quality Objectives have been set for the future.

Our consultation phase includes:

- a formal launch to an invited audience on **8 December 1995 at Syon Park**
- distribution of this report, and a summary leaflet to key organisations, groups and individuals
- placing of information in libraries and local authority offices
- publicity through contact with the local media and advertisements in the local press
- open public meetings (5 pm - 8 pm) at:
 

- Hounslow Civic Centre, Lampton Road, Hounslow	- Wednesday 17 January 1996
- Harrow Civic Centre, Station Road, Harrow	- Wednesday 7 February 1996
- Northolt Memorial Hall, off Ealing Road, Northolt	- Tuesday 13 February 1996
- Barnet Town Hall, The Burroughs, Hendon	- Thursday 15 February 1996

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

If you wish to comment please do so by **8 March 1996**. The Action Plan for the Brent and Crane Catchments is programmed for publication by the end of June 1996. However, we recognise that the responses we receive may influence this programme. Please send your comments to:

**Stuart Reilly, National Rivers Authority-Thames-Region**  
**The Grange, 97 Crossbrook Street**  
**Waltham Cross, Herts, EN8 8HE.**

For further information please contact Stuart Reilly (Forward Planning Officer) on 01992-645030.



*The purpose of this section is to review the physical resources of the catchment, the uses made of the water environment and the activities likely to affect it. In most cases the description involves a brief summary of the available information and a synoptic map. Supporting documents (see Appendix III) may be available if further information is required.*

The Brent and Crane catchments cover an area of 275 square kilometres on the north-west corner of London with just over 1 million people living in the catchments. The catchments are predominately urban in character and include Edgware, Hendon, Harrow, Wembley, Hillingdon, Hounslow and Ealing. Major road and rail corridors into central London cross the catchments and Heathrow Airport lies in its south-west corner.

The Brent and Crane rivers both drain into the River Thames. The lower reaches of the River Brent are navigable downstream of its confluence with the Grand Union Canal (GUC) at Green Lane, Hanwell. Whereas, the lower reaches of the Crane are tidal for a short distance before its confluence with the River Thames at Isleworth. Within the Brent and Crane catchments there are two stretches of the GUC - the Main Line and the Paddington Arm, which British Waterways are responsible for managing.

The Brent catchment contains the Brent or Welsh Harp reservoir which was built in 1835 to provide a water supply to the GUC. It is no longer required for this purpose and is now important as a recreational resource, in terms of its nature conservation value and because it provides flood water storage.

There are many tributaries joining the Brent and Crane rivers. These rivers and streams are critical as they are a local amenity and wildlife resource. A number of these tributaries have had a history of flooding problems and have led to flood alleviation projects being undertaken on the Yeading Brook, Deans Brook and Wealdstone Brook as well as the Brent and Crane rivers themselves.

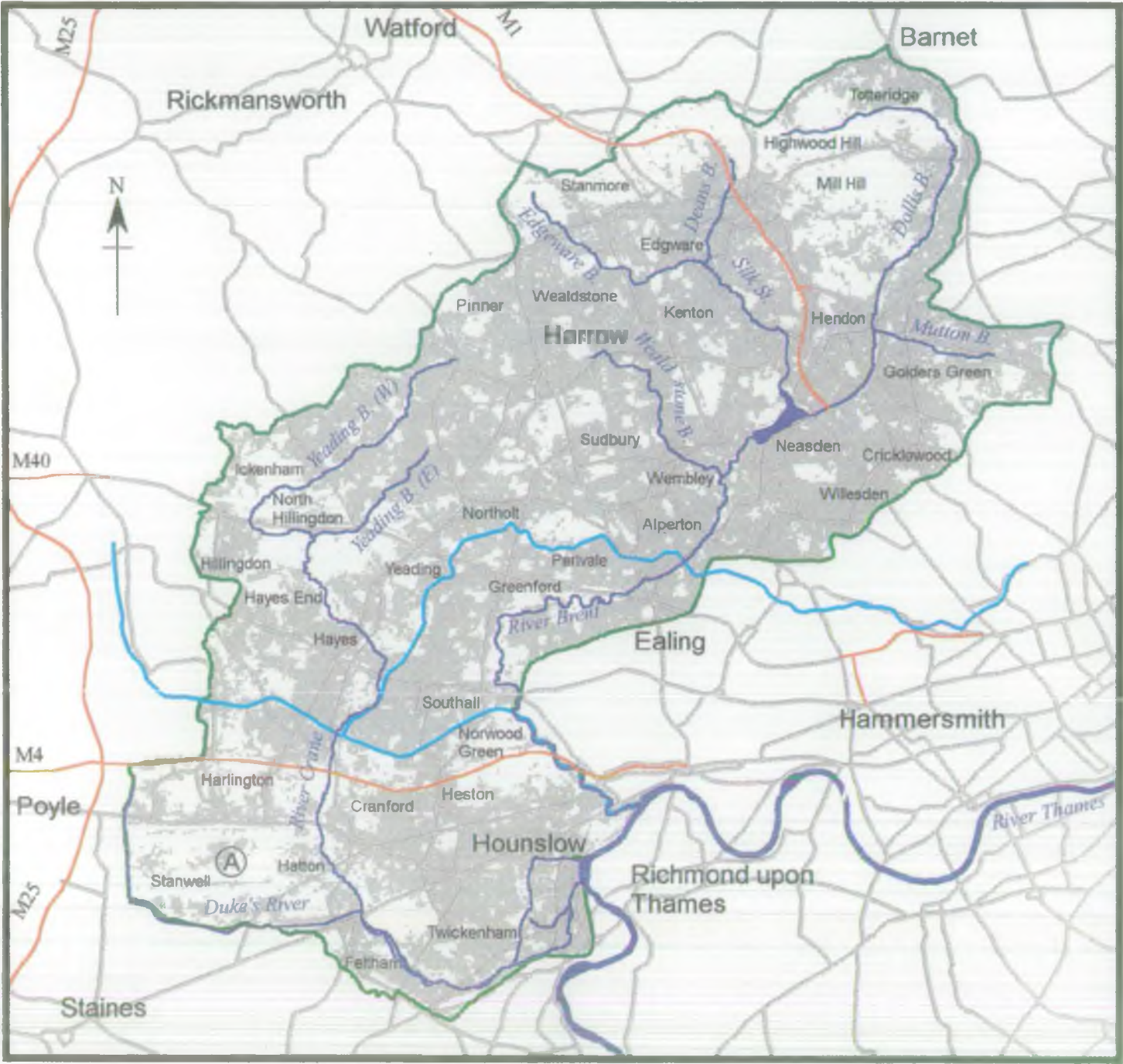
The rivers of the Brent and Crane catchments flow through mainly urbanised areas, and as a result are at risk from different types of pollution compared with rural rivers. Surface water run-off from roads containing oil and other pollutants has a major impact. The catchments also suffer from problems with the sewerage system, including domestic misconnections of foul water to surface water sewers and blocked storm water overflows. The poor water quality, particularly in the Brent catchment, has a significant effect on both the fisheries and biological quality of the rivers.

A significant proportion of the accessible open space within the catchments is associated with the river and canal corridors. The value of these open areas has been recognised by the local planning authorities who have designated most of these areas as Green Belt, Metropolitan Open Land, and/or Green Chains. Riverside walks are plentiful throughout the catchments, although obstructions such as major roads and the tube system currently interrupt the network in several locations.

The catchments are the subject of some major development proposals. Of particular note, is the possible expansion of Heathrow Airport, the development of Prospect Park and highway improvements, including motorway widening. These developments all pose a possibility of pollution to the groundwater and surface water and a reduction in the capacity of the flood plain.



CATCHMENT OVERVIEW



KEY

	Catchment Plan Boundary		Roads			
	Main River		Airport			
	Grand Union Canal					
	Urban Area					
	Motorways					

Scale (approx)  
0 5 km

**Introduction**

Actions affecting the water environment within the catchments 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 local amenity groups. Each of these have their own particular aims and objectives which, taken together, create the framework for action and change in the catchments.

**TABLE 1 : KEY STATISTICS FOR THE CATCHMENTS**

Catchment Area	
- River Brent	151 square km
- River Crane	124 square km
- Total	275 square km
Population	1,042,369
Length of main river	111 km
Length of navigable river/canal	27 km
Number of Local Authorities	9

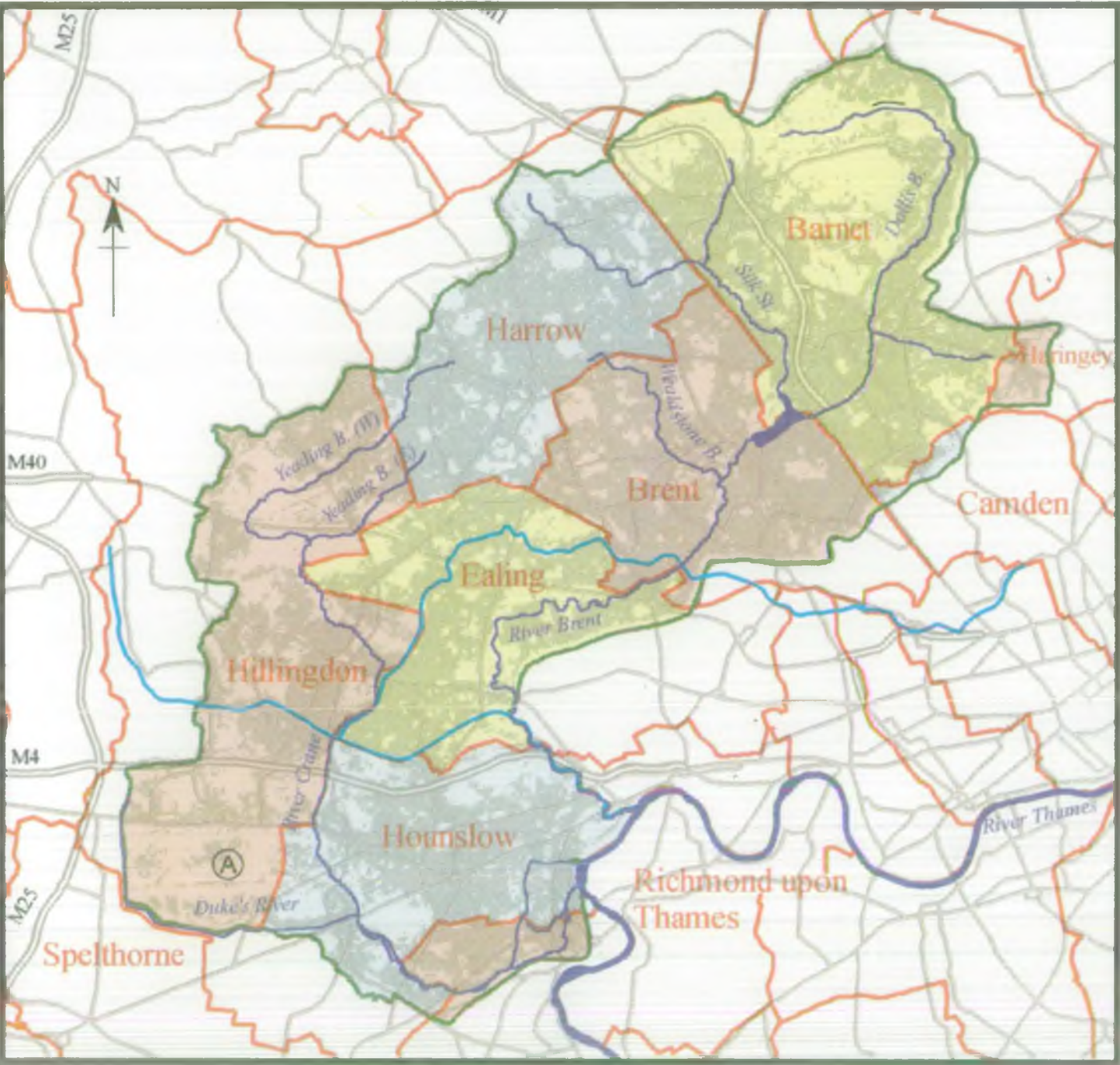
There are nine local authorities within the Brent and Crane catchments as illustrated in the figure opposite and described in the table below.

**TABLE 2 : DISTRIBUTION OF THE CATCHMENTS AREA AND POPULATION BY LOCAL AUTHORITY**








LOCAL AUTHORITY	PROPORTION	
	AREA	POPULATION
	%	%
LB Barnet	23	20
LB Hillingdon	19	16
LB Brent	14	19
LB Harrow	13	16
LB Hounslow	13	3
LB Ealing	13	12
LB Richmond Upon Thames	2	12
LB Camden	1	1
LB Haringey	1	1



LOCAL AUTHORITIES



KEY

	Catchment Plan Boundary		Roads			
	Main River		Airport			
	Grand Union Canal					
	Urban Area					
	Local Authority Boundary					

Scale (approx)

0 5 km

### *Sustainable Development*

The NRA is committed to the principles of sustainable development and embraces the definition set down by the Brundtland Commission in 1987:

"...development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

Sustainable development was given added impetus when the UK and other governments signed up to Agenda 21 at the Earth Summit in Rio de Janeiro. This is an environmental action plan for the next century, which recognises the central role of local authorities and the value of partnerships in achieving sustainable development.

Since the United Nations "Earth Summit" in June 1992, local authorities have been considering their responses to Agenda 21. This document encourages wider access to environmental information, greater community participation in decision making and the adoption of sustainable development principles.

The London Planning Advisory Committee's (LPAC) latest advice (1994) to the London Boroughs stresses the importance of sustainable development and the need to develop land use policies around sustainable development principles. LPAC recognise that London's rivers and their valleys form the city's greatest, but most under used natural resource.

For its part, the NRA Thames Region has produced its own Agenda 21 consultation document "Thames 21" which was launched in September 1995. This looks to establish a sustainable strategy for the water environment within Thames Region of which the Brent and Crane catchments cover a significant part.

Thames 21 stresses the need for closer partnership between all the agencies involved in the local management of catchments and highlights the role of Catchment Management Plans in translating broad principles into local action.

### *Statutory Bodies*

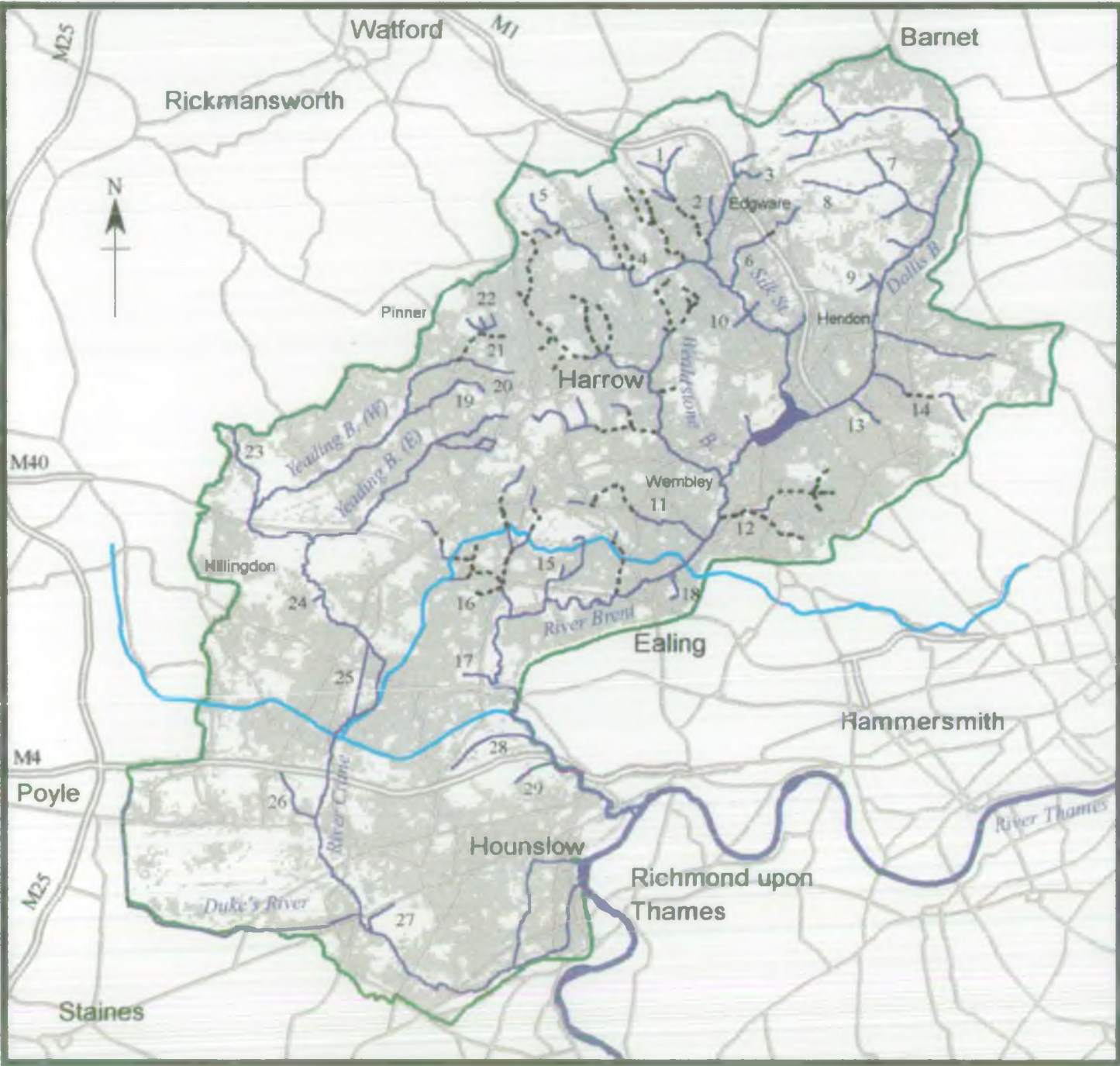
The National Rivers Authority is the statutory body responsible for the protection and enhancement of the water environment. Our mission statement is on the inside front cover of this document.

The NRA often work closely alongside Her Majesty's Inspectorate of Pollution (HMIP). HMIP controls releases to air, water and land from industrial processes with the greatest potential to pollute.






The statutory body responsible for the Grand Union Canal, which comprises both the Main Line and the Paddington Arm, is British Waterways (BW). BW carry out maintenance work on these waterways. This includes dredging, lock repairs, bank protection, towpath works and sign posting. BW promote the use of canals for recreational purposes. BW also own the Brent Reservoir.



ORDINARY WATERCOURSES



KEY

	Catchment Plan Boundary	Ordinary Watercourses :		
	Main River	1 Edgwarebury Brook	11 Wembley Brook	23 Ickenham Stream
	Grand Union Canal	2 Broadfields Ditch	12 Mitchell Brook	24 Hayes Park Stream
	Roads	3 Nutwood Stream	13 Clitterhouse Brook	25 Hayes By-pass Channel
	Culverted Watercourse	4 Marsh Land Ditch	14 Decoy Brook	26 Frog's Ditch
		5 Wemborough Ditch	15 Perivale Park Brook	27 Hounslow Ditch
		6 Watling Brook	16 Coaton's Brook	28 Osterley Park Boundary Stream
		7 Totteridge Common Brook	17 Dormer's Well Stream	29 Wyke Green Ditch
		8 Folly Brook	18 Twyford Abbey Ditch	
		9 Hendon Cemetery Brooks	19 Smart Brook	
		10 Tramway Ditch	20 Greenhill Stream	
			21 Elmershot Stream	
			22 Headstone Park Branch	

Scale (approx)

0 5 km



LPAC came into existence in 1986 to replace the strategic planning functions of the former Greater London Council. It advises the London Boroughs on their approach to their Unitary Development Plans (UDP) and informs Central Government of Borough's policies and views on land use matters. LPAC produced their Advice on Strategic Planning Guidance for London, after formal consultation, in 1994. This informed the subsequent review of Strategic Guidance for London.

Within the Brent and Crane catchments there are nine local authorities. The London Boroughs have responsibility for a wide range of local services including land use planning, environmental health, land drainage on "ordinary" watercourses and household 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 the Environment (DoE) sets the overall policy guidance for the NRA and 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 the 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 Office for London (GOL).

There are several other governmental agencies apart from the NRA which have responsibilities within the catchments. English Nature (EN) is concerned with nature conservation and there are several areas of particular value within the catchment eg. Brent Reservoir. English Heritage (EH) are concerned with the conservation of the built environment. Other organisations such as the Sports Council (SC) and the Countryside Commission (CC) also have specific interests in the catchments.

The fact that there are a number of local authorities within the catchments, can present co-ordination and communication problems. Although none of the local authorities are completely contained within the catchments, Hillingdon, Barnet and Brent have a high proportion of their area situated within the boundary. Other authorities such as Haringey and Hounslow only have a small portion of their area within the catchments.

Most local authorities have recently revised, or are currently revising, their statutory land use development plans. These documents give detailed policies for controlling development. When considered in conjunction with Regional Planning Guidance for the South East of England (RPG9) (DoE, 1994), Strategic Guidance for London (RPG3) (DoE, 1989), draft replacement Strategic Guidance for London (RPG3) (DoE, 1995) and LPAC's Strategic Planning Guidance for London (1994), these set the land use policy context for the catchments.

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 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 current land use development plans and regional guidance relevant to the catchments:

**Regional Planning Guidance**

RPG9 Regional Planning Guidance for the South East (DoE, 1994)

RPG3 Regional Planning Guidance: Strategic Guidance for London (DoE, 1989)

RPG3 Draft Replacement Regional Planning Guidance: Strategic Guidance for London (DoE, 1995)

**Unitary Development Plans**

LB Barnet	Adopted 1991	LB Harrow	Adopted 1994
LB Haringey	Post-inquiry, adoption expected 1996	LB Brent	Expected adoption 1995
LB Camden	Post Deposit	LB Hillingdon	Expected adoption late '96
LB Ealing	Adopted August 1995	LB Hounslow	Expected adoption 1996
LB Richmond	Post Inquiry		

**Water Supply and Sewage Disposal**

Thames Water Utilities Ltd (TWUL) and Three Valleys Water Company (TVWC) are the major supplier of drinking water in the catchments. They also treat and dispose of foul water from our homes, work, shops etc. The way in which they control and carry out their business has a significant impact on the water environment (see Section 2.10, 2.11 and 3.2).

**Other Organisation and Non Statutory Bodies**

A range of national and local groups also have an interest in the Brent and Crane catchments. These include the Welsh Harp Conservation Group, the Royal Society for the Protection of Birds (RSPB), the Welsh Harp Joint Consultative Committee, the Brent River and Canal Society, London Ecology Unit, West London Waterway Walks (WLWW) and the Ealing Wildlife Network.

Other bodies with an interest in the catchments include environmental pressure groups such as Friends of the Earth (FoE), the London Wildlife Trust and specific area based groups like the Barn Hill Conservation Group. Local amenity and interest groups such as the Welsh Harp Sailing Association, the Elstree and Borehamwood Green Belt Society and the Access in Barnet group, angling clubs, canal users and boating groups are also concerned with the water environment and have an important role to play.

**Partnerships**

Partnerships have been set up in response to a number of specific initiatives. Examples include: a Single Regeneration Budget (SRB) bid for the complete redevelopment of Wembley Stadium; the successful SRB bids for the Park Royal Partnership project and Brentford SRB; and the Thames Landscape Strategy and Hounslow based Millennium Bid (further information is given in Section 2.12). These groups tend to draw on representatives from already established groups, the private sector 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.



*Existing Strategies*

Several organisations have already developed strategies relevant to the water environment in the catchments. These include:

**TABLE 3 - EXISTING STRATEGIES**

Document	Date	Authority
Hounslow Waterside Strategy River Thames, River Brent and Grand Union Canal	1993	LB Hounslow
Green Belt Management Plan	1992	LB Hounslow
Hounslow's Environmental Charter	1993	LB Hounslow
Hounslow Green Strategy	1993	LB Hounslow
Environmental Strategy Third Annual Report	1994	LB Barnet
Countryside and Green Space Management Strategy - Third Revision	1994	LB Barnet
The Green Agenda - Harrow's Environment for the Future	1994	LB Harrow
A Borough Forest Strategy	1992	LB Ealing
Brent River Park Management Plan	1990	LB Ealing
Horsenden Hill Countryside Management Plan	1985	LB Ealing
Thames Landscape Strategy	1994	LB Richmond Upon Thames, Elmbridge BC, LB Hounslow, LB Kingston upon Thames
Welsh Harp Management Strategy	1993	Welsh Harp Joint Consultative Committee
Nature Conservation Handbooks for Boroughs including Brent, Hillingdon, Harrow, Hounslow, Ealing, Camden and Richmond	1987- 1993	London Ecology Unit

The NRA seeks to influence these strategies for the overall benefit of the water environment and to coordinate its own actions and policies as far as possible to those in such strategies. To this end these strategies have been considered during the preparation of this plan.

### *Summary*

Taken together this wide collection of bodies (there are many others not mentioned above which have been contacted during the compilation of this report - see Appendix V) make up the diverse and complex structure of local management for the Brent and Crane catchments.

### *Geology*

The underlying solid geology of the catchments is almost exclusively London Clay (see Geology map). The London Clay overlays the Woolwich and Reading Beds of clays, loams and pebbles which in turn overlay the Upper Chalk Beds of London. The virtually impermeable London Clay extends over the whole of the Brent and Crane catchments thinning out to the north towards Hertfordshire where it meets the Upper Chalk and increasing in depth southwards, reaching thicknesses of 100-150 metres near the River Thames.

The Woolwich and Reading Beds underlying the London Clay are exposed in the northwest of the Crane catchment around Harrow. These are clayey, fine grained sands, which are generally in hydraulic continuity (ie. directly linked) with the underlying chalk. Elsewhere, in isolated areas on the higher ground north and east of the Brent Reservoir, in the Brent catchment, Bagshot Beds and Claygate Beds of sand and loams occur. These are too insignificant in some cases to be included in the generalised geology map.

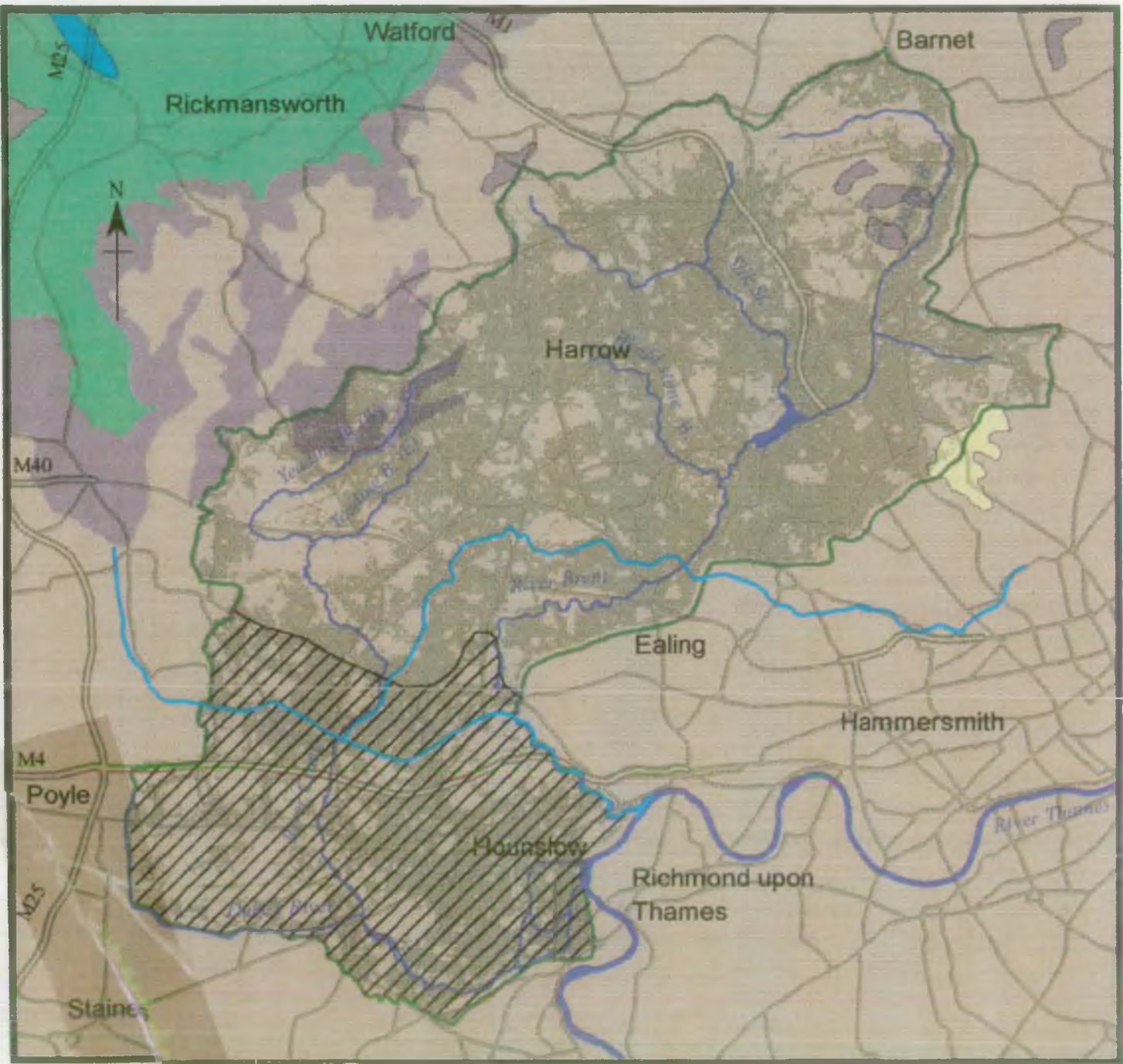
In the southern half of the Brent and Crane catchments, the London Clay is almost entirely covered by more recent deposits of River Terrace Gravels. These gravel deposits increase generally in depth nearer the River Thames and are overlain in places with Brickearth which has deposited during glacial periods. In the vicinity of Osterley Park the watercourses have cut through the gravels to expose the London Clay beneath. The presence of gravels in the southern half of the catchments has implications for its hydrology (see Section 2.4), water abstraction (see Section 2.10) and water quality (see Section 3.1) in particular.

Small deposits of Brickearth and glacial gravels also occurs in the north east of the Brent catchment in North Finchley and Hendon. In addition to the deposits of gravel and Brickearth, a narrow band of alluvium has been deposited along most of the River Brent and the southern half of the River Crane.












### *Soils*

Soil type is influenced by the underlying geology and in turn influences how rainfall runs off the catchments surface. Permeable soils such as chalky or sandy soils allow water to infiltrate through the ground. However, clayey soils are less permeable and water tends to run off into ditches and streams or collect on the surface rather than soaking into the ground during heavy rainfall. Most of the Brent and Crane catchments consist of clayey soils, particularly towards the top of the catchments beyond the deposits of river gravels.





KEY

	Catchment Boundary	Geology				
	Main River		London Clay		Middle Chalk	
	Grand Union Canal		Reading / Woolwich Beds	Drift Geology		
	Urban Area		Middle Bagshot Beds		River Gravels - Within Catchments	Scale (approx) 0 5 km
	Roads		Upper Chalk			

### *Introduction*

Flow in the Brent and Crane rivers is essentially run-off from urban areas, with some flow being contributed by water stored in the glacial gravels. The rivers react very quickly to rainfall events (see hydrographs overleaf), with reaction times being as little as half an hour in a significant storm event. Both rivers drain into the tidal Thames, with the Crane having a tidal barrier which is intended to alleviate tidal flooding problems. On the Brent, extensive flood alleviation works in the lower section mean that a tidal barrier is not necessary.

### *River Brent*

The River Brent and its tributaries (which cover a catchment area of some 151 km<sup>2</sup>) flow primarily across London Clay. The clay itself contains lenses of glacial gravels, with River Gravels and Alluvium occurring along the river corridor. Increasing amounts of glacial silts and gravels are found in the south of the catchment. The upper part of the catchment has characteristic slopes of a 1 in 20 or a 1 in 30 gradient, but the lower part is much flatter, with slopes typically of 1 in 1000 or less.

The Brent has several tributaries including the Dollis Brook, Wealdstone Brook, Mutton Brook, Deans Brook, Silk Stream and Edgware Brook many of which have permanent gauging stations (see Table 4). The Dollis Brook rises in relatively open ground near Moat Mount, flows eastwards to Totteridge then southwards through North Finchley and Hendon and thence into the eastern part of the Brent Reservoir. The Edgware Brook starts at Bentley Priory Lakes, flows in a general easterly direction to Edgware and the confluence with Deans Brook, which rises near Scratchwood Services and flows south. Downstream of the confluence of the Deans Brook and Edgware Brook the watercourse becomes the Silk Stream and flows south eastwards to the Brent Reservoir.

The Brent Reservoir was originally constructed in 1835 to supply water to the Grand Union Canal (GUC) which runs through the catchment, but the reservoir is occasionally used for flood attenuation. However, the reservoir still supplies water to the Grand Union Canal via the feeder channel, at a low, but continuous rate. The reservoir is also important for recreational and conservation purposes. Downstream of the reservoir, the Brent flows southwest then westwards to Greenford, where it turns south and is joined by the GUC, just south of Hanwell. The Brent downstream of the confluence with the GUC is canalised, with locks on the navigable sections and side loops, which represent the original course of the river.





NRA Thames Region

TABLE 4 : BRENT FLOW GAUGING STATIONS

River	Station	OS Grid Reference	Mean Annual Flow m <sup>3</sup> /s
Brent	Greenford	TQ148822	1.132
Brent	Monks Park	TQ202850	0.965
Wealdstone Brook	Wembley	TQ193862	0.153
Silk Stream	Colindeep Lane	TQ217895	0.240
Brent	Brent Cross	TQ236880	0.342
Dollis Brook	Hendon Lane	TQ240895	0.237

**River Crane**

The Crane catchment, which includes the Duke of Northumberland's River, drains an area of 124 km<sup>2</sup>. It is a very flat catchment, which once supported a large number of London's market gardens. The legacy of this period is the labyrinth of artificial watercourses and backwaters which flow in and out of the Crane, some of which were constructed to feed flour and gunpowder mills. The river rises in the Harrow area and flows south-westwards in two branches, the Yeading Brook West and East. The former starts as a stream at Pinner Road, North Harrow, and the latter at Malvern Avenue, Harrow. Both arms flow south westwards and converge below the Western Avenue, Northolt. At the head of the catchment, the ground is some 60 m above sea level, although Harrow-on-the-Hill on the north east boundary rises to 120 m. The average gradient of the river valley is 1 in 30.

Below the confluence of the two Yeading Brooks, the river flows in a southerly direction to a point south of Hayes Road, Southall, where the name of the watercourse changes to the River Crane. The average gradient of the lower part of the Crane is 1 in 1000. The Crane flows southward through Cranford and just north of Staines Road, Hounslow. The Harmondsworth part of the Duke of Northumberland's River joins the Crane at Baber Bridge.

As the Crane flows south east from Baber Bridge, it is divided into two channels which run in parallel at different levels, with cross connections (which fed gunpowder, copper, snuff and flour mills in the past) flowing between them. The Crane flows in a single channel from near Mereway, Twickenham and joins the Thames at Isleworth. The Duke of Northumberland's River leaves the Crane flowing north to Mogden then east to Syon Park at Isleworth, where it joins the Thames.



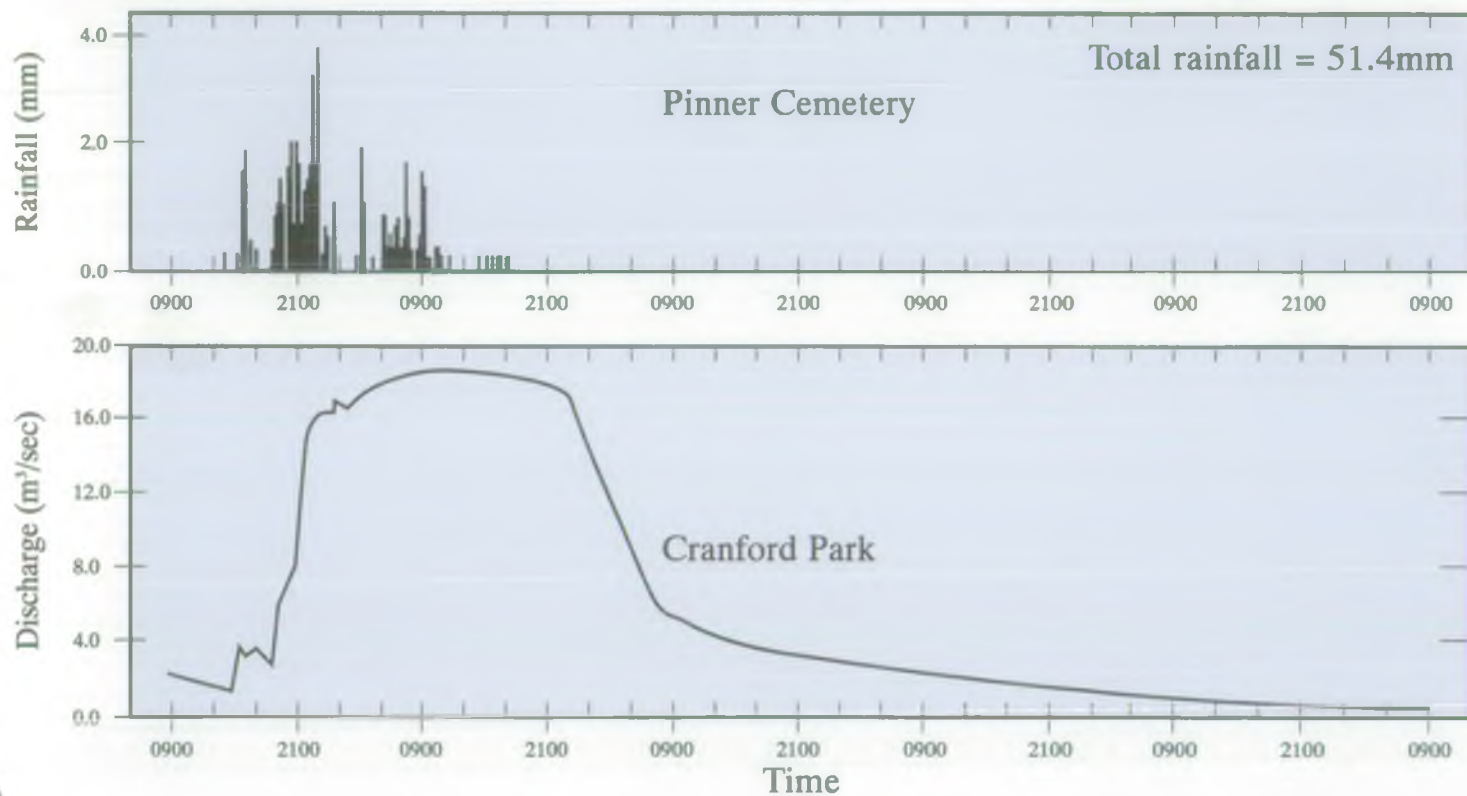
## HYDROGRAPHS FOR BRENT &amp; CRANE CATCHMENT

5 day plot starting 0900 Gmt on 12/10/93

River / Catchment: Crane

Rain Gauge: Pinner Cemetery

River Gauge: Cranford Park



5 day plot starting 0900 Gmt on 12/10/93

River / Catchment: Brent

Rain Gauge: Brent Reservoir

River Gauge: Monks Park

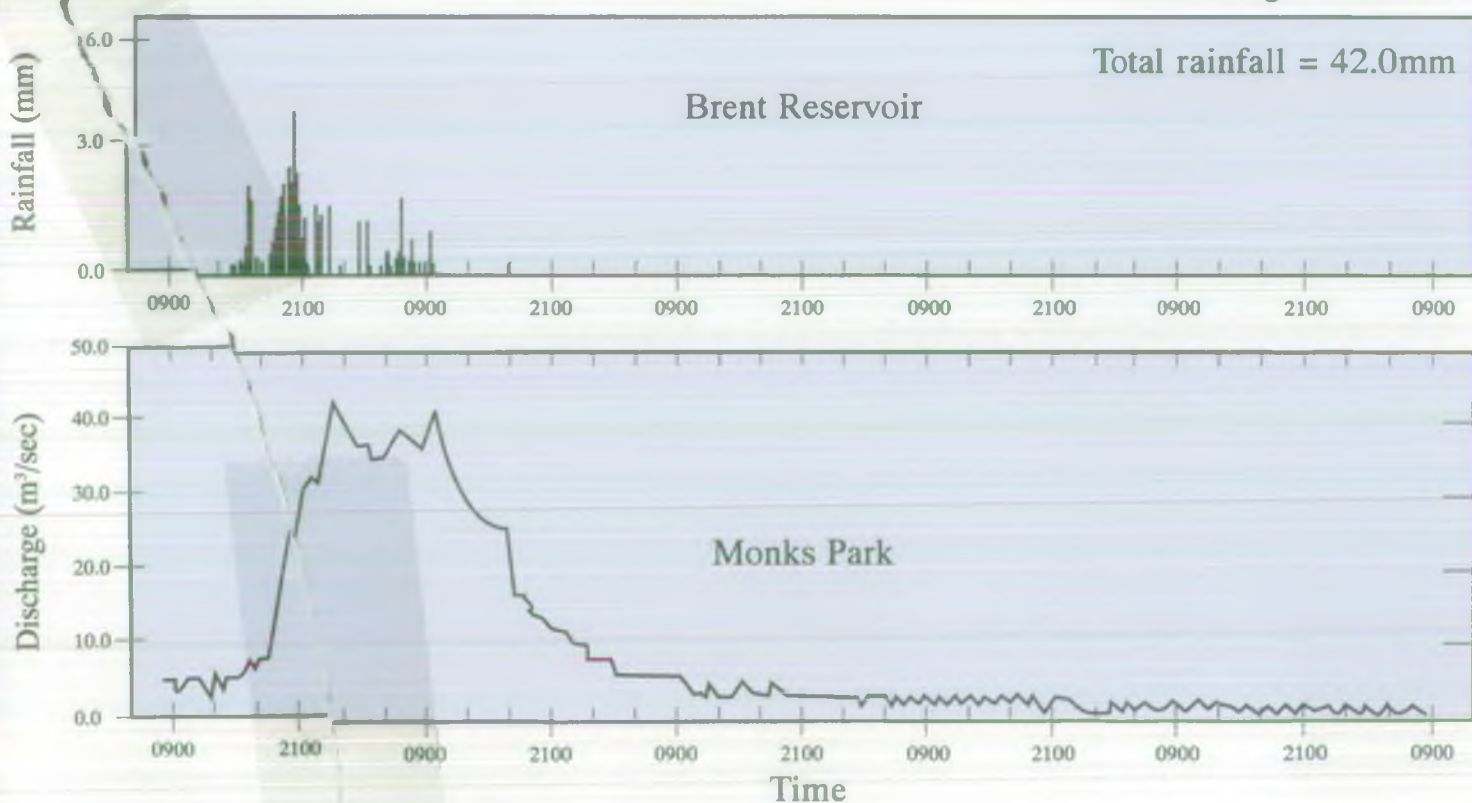


TABLE 5 : CRANE FLOW GAUGING STATIONS

River	Station	OS Grid Reference	Mean Annual Flow m <sup>3</sup> /s
Duke of Northumberland's	Mogden	TQ153753	0.388
Crane	Cranford Park	TQ103778	0.511
Yeading Brook East	Western Avenue A40	TQ111845	0.073
Yeading Brook West	Yeading West	TQ083846	0.139



### Introduction

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

The smaller headwater streams draining the clay hills of this area are 'flashy' with peak water flows following quickly after rainstorms. This naturally promotes steep, eroding banks and in-channel debris dams (eg. the fallen branches of bankside trees). The fauna and flora of these headwaters is naturally determined by factors such as shading, and the severity of physical conditions. Particular aquatic invertebrates are characteristic of these stream ecosystems along with minor fish species such as nine and three spined sticklebacks, minnows, loach and bullhead. Water dependent plants such as sedges (*Carex spp*), mosses and liverworts occur on the banks.

Further downstream the larger streams and rivers can be expected to have both a more open aspect and a more benign physical nature, as peak flows are naturally reduced by overtopping and local flooding. These riverine ecosystems are characterised by a greater variety and abundance of flora and fauna. Instream growths of emergent and submerged aquatic plants reflect variations in channel dimensions, water depths and riverbed substrates. Under such circumstances, natural river channels may contain a range of different physical environments such as fast flowing riffle areas, less turbulent runs or glides and deeper pools. This wide variety of ecological conditions may occur naturally within relatively short sections of river, particularly if a channel follows a sinuous course. These physical and biological attributes of rivers are important to a river's ecology. In combination with local geographic and geological factors, they determine the nature and variety of communities of plants, invertebrates, fish and the other wildlife a watercourse can support.

### Key Human Influences

The ecology of the catchments has been altered by a range of human activities associated with the progressive urbanisation of this area over the last 100 years. Urbanisation has caused physical changes, such as a loss of floodplain to urban development and increased rate of surface water run-off and flashiness of flows in rivers and streams. These hydrological changes have led to flood prevention measures, including a lowering of water levels through channel deepening, alteration to channel dimensions and the use of flow regulation structures and bank protection to prevent erosion.

These changes have resulted in a high proportion of modified channels and, where conditions are highly artificial (eg. concrete lined watercourses), this has culminated in severely degraded instream, river margin and bankside habitats and greatly reduced ecological value and potential. Increased scour effects during high flows allied to "hard" bank protection measures can prevent colonisation by aquatic plants and the important habitats they provide. Washout of fish (especially fry and juveniles) during high flows is a particular problem in engineered, uniform channels where the natural obstructions provided by instream objects or irregular earth banks have been removed. Whilst a number of invertebrate species are adapted to live in fast flowing conditions, a high proportion, normally resident in streams and rivers, also depend upon these slackwater areas or refuges, amongst submerged tree roots for example. See Issue 4.3 - Man Made Materials, Culverting and River Flows pages 98, 99 and 101.

Loss of wetland areas through improved drainage and through abandonment of traditional, sustainable wetland management has also reduced the ecological value of particular areas.

Urbanisation has also had an influence on water quality, with increasing volumes of polluted urban run-off entering watercourses. The reduced time of travel within artificial channels and loss of much 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. See Issue 4.2 - Water Quality pages 93 to 97.

### ***Current Situation***

Information concerning the ecological status of rivers, streams and canals is obtained by the NRA from a combination of river corridor, biological and fisheries surveys. Further data, such as chemical water quality, hydrology and geomorphology, is also collected by the NRA. Information is also collected and held by other bodies including the London Ecology Unit, Borough Councils and Wildlife Trusts. An integrated approach towards the assessment of ecological status and in the design and implementation of measures to restore or protect ecological value is recognised as the most effective approach.

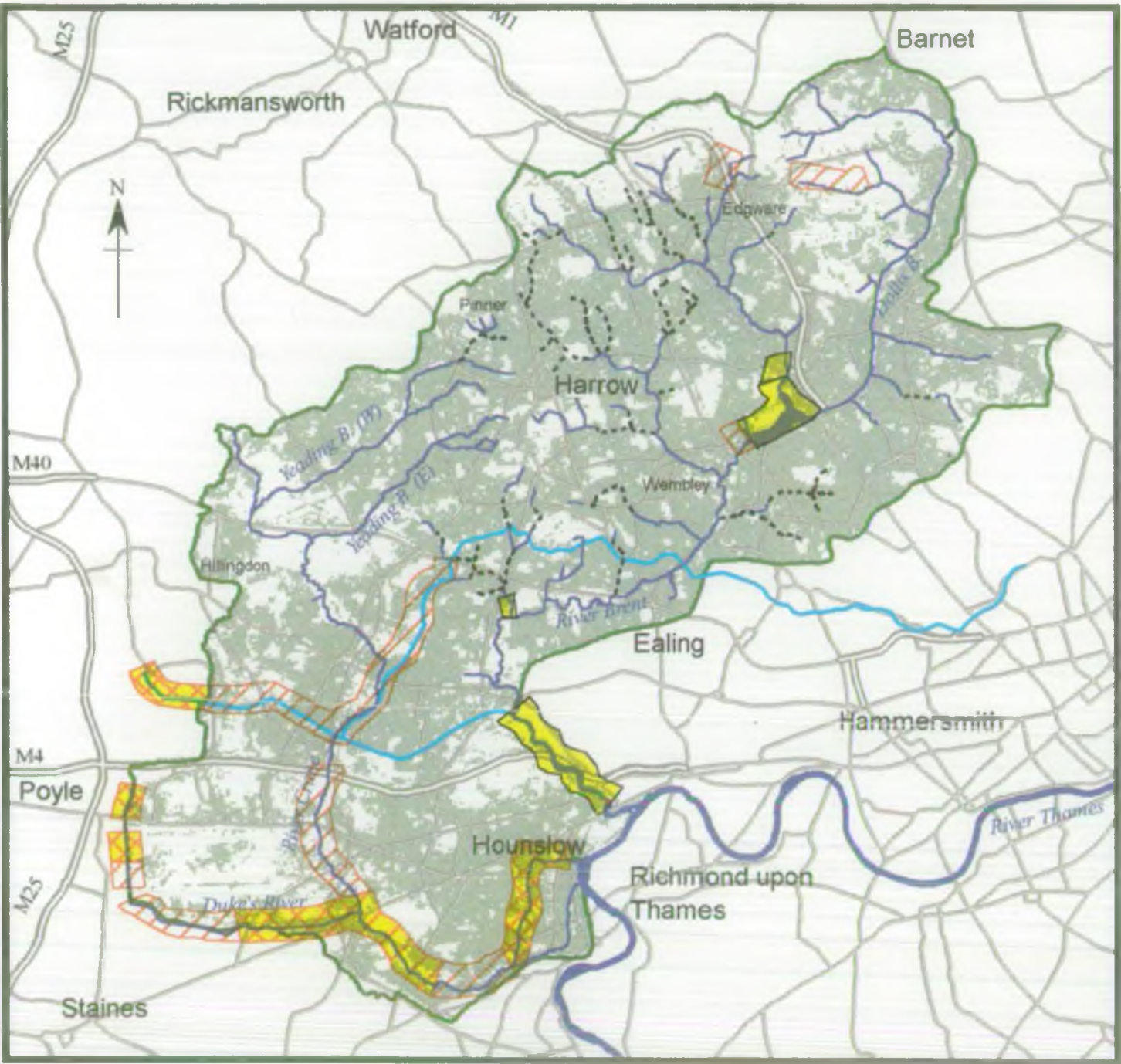
The map showing critical habitats identifies sections of watercourse which retain ecological features of interest, identified by NRA river corridor surveys and/or biological surveys.

The distribution of instream habitats and macroinvertebrate communities, of high ecological value, is more limited since these ecological features require a well preserved or naturalised river channel, together with at least moderate water quality. Examples of this are restricted to sections of the River Crane, Duke of Northumberland's River, Grand Union Canal and several isolated tributary streams (see Section 3.1). Macroinvertebrates have not been sampled by the NRA in the Brent Reservoir, although some studies have been undertaken by Middlesex University.









The Duke of Northumberland's River (particularly in its upper section) contains important, highly diverse assemblages of invertebrates and the number of different taxa (groups of fauna) captured in samples at several sites is equivalent to the top 5-10% in national surveys of rivers. A large number of species of caddisflies, mayflies, molluscs, leeches and other invertebrate groups have been recorded from this river which are not found elsewhere in the catchment.

The River Crane benefits from close proximity to the pool of species found in the Duke of Northumberland's River and supports important assemblages of invertebrates from an increasingly varied number of groups. There is strong evidence of a persistent improvement in the invertebrate life of the River Crane and Yeading Brook in recent years. The variety of mayflies, caddisflies, water beetles, bugs and dragonflies recorded in this river is increasing, and invertebrates such as Banded Agrion damselflies (*Calopteryx splendens*) can now be seen upstream as far as Charville Meadows.

CRITICAL HABITATS



KEY

Catchment Plan Boundary		Important Ecological Features		Scale (approx) 0 5 km
	Main River		Moderate Diversity / Relict Invertebrate Populations	
	Culverted Watercourse		Semi Natural Invertebrate Populations	
	Grand Union Canal		Good Fish Populations	
	Urban Area		Roads	



The Folly Brook is identified as ecologically valuable since it supports large populations of a stonefly *Nemoura cinerea* (Nemouridae) along with populations of caddisflies such as *Plectrocnemia conspersa* (Polycentropidae) and *Micropterna sequax* (Limnephilidae) which are characteristic of headwater streams. Though all these invertebrate species are fairly common and widespread in the wider Thames catchment they are not recorded elsewhere in these catchments. The Deans Brook supports a moderate variety of invertebrate species in a well preserved section of channel and corridor. A series of on-line lakes also serve to buffer this section of the stream against episodes of poor water quality. Downstream the ecology of the brook is degraded as it re-enters highly urbanised surroundings.

The catchments also contain important marginal habitats and habitats strongly influenced by the river system. For example, Yeading Brook Fields which straddles the boundary of Ealing and Hillingdon contains important damp hollows supporting rare plants, and the marginal vegetation of river itself here is of value. The River Crane in Hounslow, contains excellent marginal and damp ground habitats and the Brent Reservoir supports extremely valuable marginal features, such as reed beds.

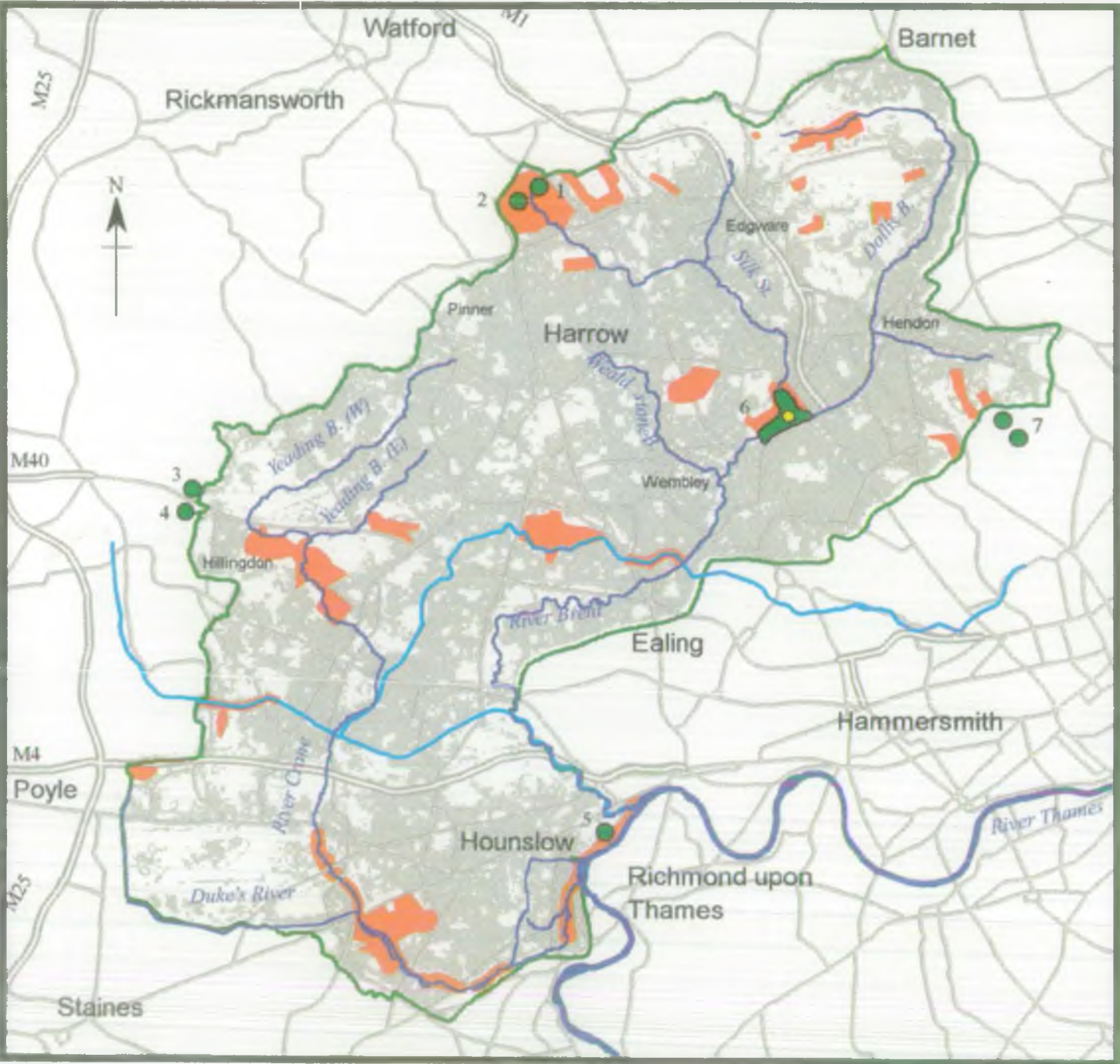
### *Designated Nature Conservation Areas*

The Brent and Crane catchments host a variety of nature conservation designations related to the water environment (see map opposite). Within or adjacent to the catchments are 7 Sites of Special Scientific Interest (SSSI), including the Brent Reservoir which is strategically important with the catchments for its habitat and wildlife. However, the reservoir faces a number of management problems including pollution, pressure from recreation and the threat of fluctuating water levels. See Issue 4.8 - Brent Reservoir page 109.

In an attempt to combat this last problem English Nature have identified the need for a Water Level Management Plan (WLMP) for the reservoir. An Intermediate Management Statement is due by the end of 1995, with a full WLMP due by the end of March 1997. It should be noted, however, that the water level in the reservoir is currently maintained at a fixed level relating to its flood attenuation function. The level increases according to the flows from the Silk Stream and Brent, but is soon restored to normal level once the automatic operating system trips into action. Water Level Management Plans are also scheduled for Berkley Priory, Denham Lock Wood, Frays Farm Meadows and Syon Park. See Issue 4.3 - River Flows page 101.

In addition to the SSSI's within the catchments, sites of nature conservation value have been identified throughout London on the advice of the London Ecology Unit (LEU). These sites are graded into Metropolitan, Borough and Local sites depending on their importance and have generally been included within each borough's UDP. The sites of Metropolitan Importance within the catchments are shown on the map of nature conservation designations. There are a total of 24 of these sites within the catchments. It should be noted that there are many Borough and Local sites in addition to these within the catchments, information on which can be obtained from the London Ecology Unit. There are also Local Nature Reserves within the catchments. These tend to be managed by the Boroughs or the Wildlife Trusts. These tend to be managed by the boroughs or the Wildlife Trusts. The NRA have recently undertaken an enhancement scheme at Crane Park Island, one of these reserves.





KEY

	Catchment Plan Boundary		SSSI		Sites of Metropolitan Importance		
	Main River	<div>1. Bentley Priory 2. Harrow Weald 3. Frays Farm Meadows 4. Denham Lock Wood 5. Syon Park 6. Brent Reservoir (Welsh Harp) 7. Hampstead Heath Woods</div>			Water Level Management Plan		
	Grand Union Canal						
	Urban Area						
	Roads					<div>Scale (approx)</div> <div>05 km</div>	

### Future Situation

The long term management of the catchments presents the opportunity to enhance the nature conservation value of the water environment. Nature conservation benefits are currently achieved by the NRA through influencing flood defence works and carrying out enhancements at targeted locations. The NRA are also undertaking research into the use of buffer zones in urban areas, the potential of de-urbanising river channels and reducing the impact of development. However, the problem that faces any future works is that benefits will be limited unless there is a significant improvement in the water quality and the physical form of the river channel found in the catchments. See Issue 4.2 - Water Quality pages 93 to 97 and Issue 4.3 - Channels and Flows pages 98 to 101.

Problems are also likely through increased urbanisation, with pressure for development being placed upon sites that are important for nature conservation or simply as open space. Invasive plant species present an additional threat, with giant hogweed, Himalayan balsam and Japanese knotweed being found in abundance throughout the catchments. See Issue 4.3 - Invasive Plant Species page 100.

### ***Introduction***

Fish populations are excellent indicators of water quality, and this is reflected within both the Brent and Crane catchments. A combination of both poor water quality and the lack of habitat for spawning fish, means that the catchments support a relatively poor fish population.

### ***Current Situation - River Brent***

The fishery survey carried out by the NRA in the autumn of 1994 indicated that the River Brent and its major tributaries was able to support small localised fish populations. A total of 12 species were recorded, with the upper Brent (above Brent Reservoir), Dollis Brook and Silk Stream supporting only one species. Three spined stickleback, roach and perch were dominant in the lower river, with other species such as eels and dace present at the confluence of the Brent and Grand Union Canal.

Fish populations were considered to be suppressed by a combination of poor water quality, an unstable flow regime (the catchment deriving the majority of its flow from urban run-off) and an impoverished instream habitat. The localised fish populations found during the survey were closely associated with artificial features such as weirs, bridges and instream rubbish. In concrete channels with no other suitable areas, such features may be important to fish as both a refuge and spawning habitat.

The importance of the Brent Reservoir as a nursery ground and source of migration into the upper Brent is also recognised, particularly in relation to the roach population associated with the Silk Stream immediately upstream of the Brent Reservoir. A fish rescue operation was carried out in the winter of 1994/95 when the reservoir was drained, the results of which provides useful information on fish populations. This discovered the presence of a non-native species of crayfish in large numbers in the reservoir. See Issue 4.8 - Brent Reservoir page 109.

Fisheries in the Grand Union Canal are managed and stocked by British Waterways. It was last surveyed by BW in 1988. Both the Main Line and Paddington Arm are known to support extensive fish populations and are popular for angling. However, downstream of the confluence with the River Brent, the GUC fishery is poor due to water quality problems.

### ***Current Situation - River Crane and Duke of Northumberland's Rivers***

The fisheries survey for these rivers was undertaken by the NRA in the summer of 1995. A total of 12 species of fish were recorded, with the population dominated by roach and chub. Encouraging numbers of juvenile chub were found as far up the system as Cranford.

The Yeading Brook supports a fish population consisting of "minor" species, such as stickleback and gudgeon. However, the upper reaches of the Yeading Brook are isolated from the Crane by an extensive section of engineered channel, with the poor habitat associated with this concrete channel preventing upstream migration of the dominant species found in the Crane itself. Similar habitat discontinuity is evident on the Crane below Cranford Park due to the impact of urban development. Limiting factors associated with the fish population appear to be poor habitat and perhaps water quality.

Sites where habitat is found to be of a higher quality, such as Hounslow Heath appeared to support the larger and more diverse fish populations. Lower down the Crane in its tidal section (approximately downstream of Northcote Road) the river supports flounder and eel. This area was identified in the NRA fisheries survey of 1988 as an important habitat, acting as a major nursery area for freshwater and estuarine fish fry. The nursery site in the Crane forms one of the only freshwater low tide creeks on the north bank of the Thames between Teddington and the River Lee which gives it further value and the need for protection.

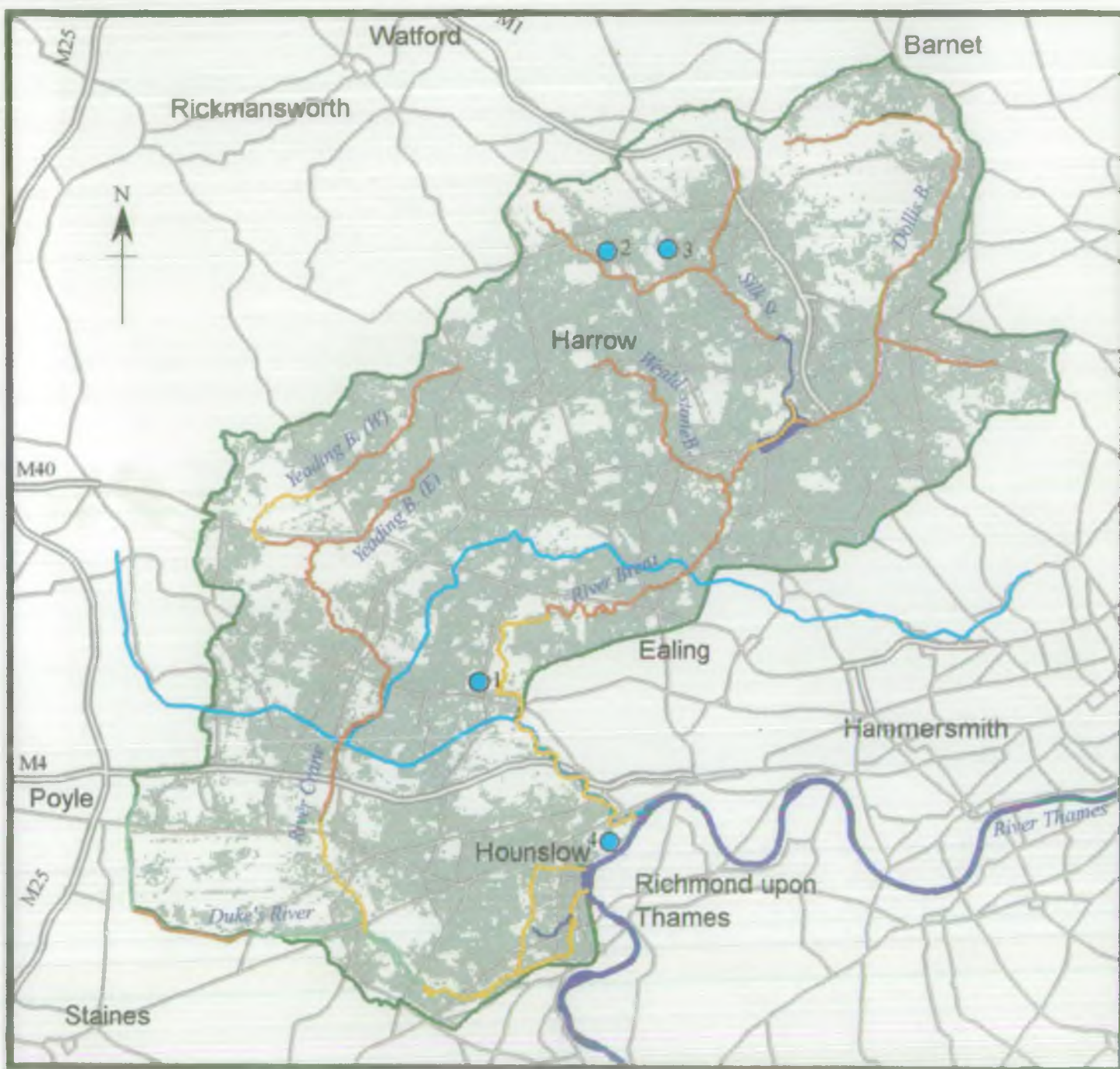
The Duke of Northumberland's River was shown to support good populations of fish, with mainly roach and chub, at both ends of the system. Downstream of the confluence with the Colne and at the Perry Oaks site, good fish populations were again identified with good habitat, faster flows, clean gravel substrate and instream vegetation making the difference. A similar situation exists downstream of Mogden sewage treatment works.

### *Future Situation*

Recommendations arising from the fisheries survey of the Brent include: a change to current land management to allow the opening up of the extensively shaded river channel present throughout the Dollis Brook; and, the formalisation of an existing island feature downstream of Hanwell Bridge, to produce a backwater refuge area for juvenile fish and fry.

The completed Crane fisheries survey will be available in April 1996, and will include recommendations on future habitat enhancement and management for these rivers. See Issue 4.10 - Fish Management page 114.





KEY

Catchment Plan Boundary		Fishery Quality	Fishing Clubs	
	Grand Union Canal	Good	1 AEC	
	Urban Area	Moderate	2 RAF Stanmore	
	Roads	Poor	3 Cannon's Park	
		Unclassified	4 Syon Park Trout Fishery	

Scale (approx)  
0 5 km



### *Introduction*

Landscape character is crucial in determining 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. The Water Resources Act 1991 requires the NRA to conserve and enhance the water environment when discharging all of its duties. These conservation responsibilities are wide-ranging and include wildlife, landscape and natural beauty, geology and physiographical features, buildings and other objects of archaeological, architectural or historic interest.

### *Current Situation*

The Brent and Crane catchments are both heavily urbanised and contain developments that encroach closely on the river channels in many places. Consequently the rivers and tributaries within the catchments no longer have a natural character over much of their length, although some stretches do remain rich in landscape and wildlife.

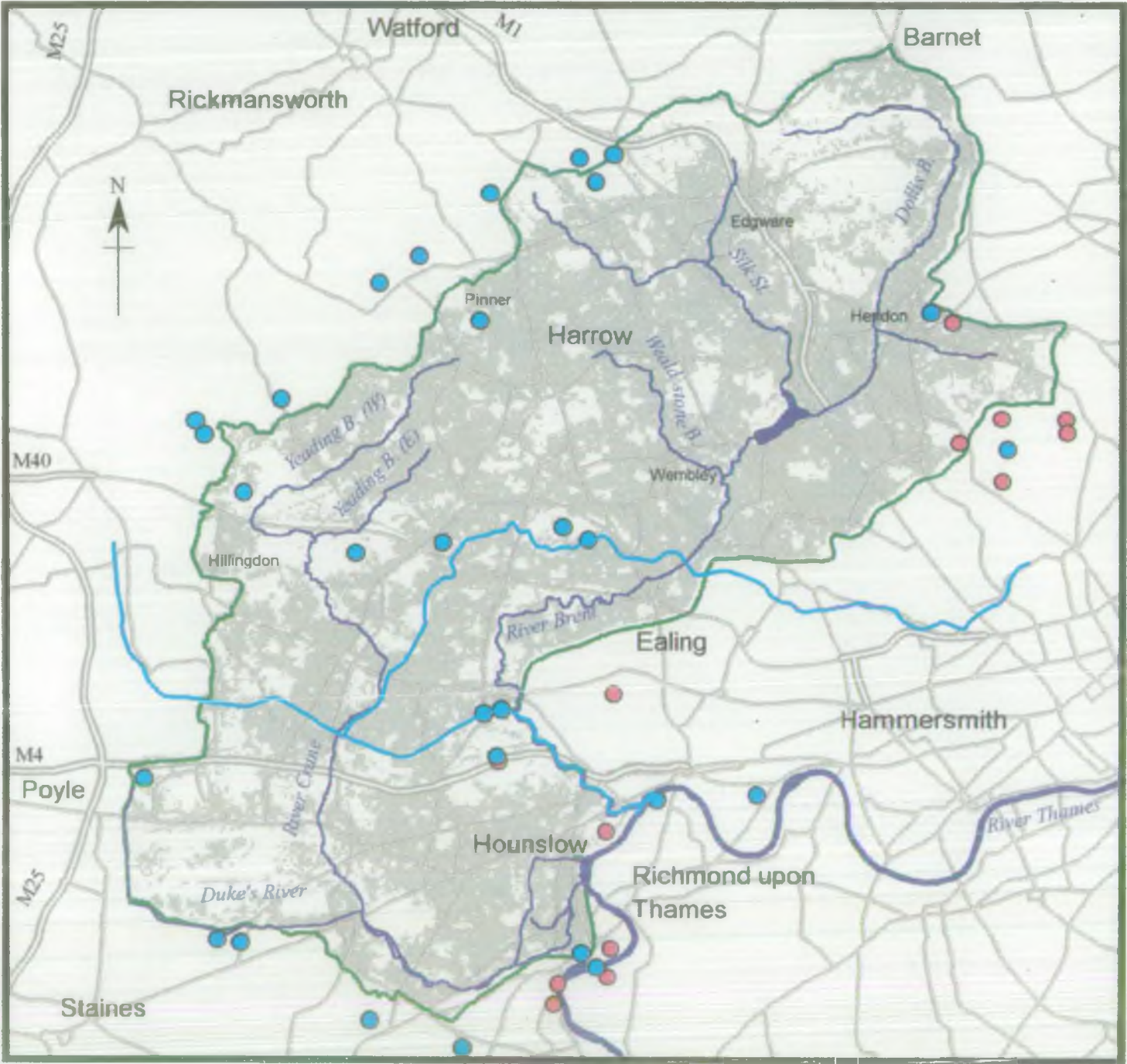
Although no catchment wide landscape assessment has been undertaken, it is evident that the landscape of the Brent and Crane catchments has been significantly affected by flood defence works. The Brent catchment was subject to a major flood alleviation scheme in the 1970's and 1980's, with the extensive deepening and widening undertaken leaving large artificial channels with vertical walls and concrete beds. **See Issue 4.3 - Man Made Materials and Culverting pages 98 and 99.** The substantial part of the corridor width taken for these channels has left little or no river margins or bankside vegetation in some places. Also access along the river corridor has become restricted or impossible in some stretches. Unfortunately the landscape quality in these areas is low and in need of significant improvement. The low landscape quality in parts of the Brent is worsened by the deposition of litter which increases the sense of neglect, although British Waterways, for example, regularly clears the litter and floating debris which is discharged via the flood channel to the GUC between Hanwell and Brentford. **See Issue 4.6 - Litter page 106.**

The Crane catchment has suffered less from the effects of flood defence works or physical encroachment, with many stretches of the river worthy of conservation. The recent flood alleviation scheme included some elements of environmental enhancement. For instance the Crane corridor at Ruislip Gardens was improved by opening out the landform of the river, screening of adjacent intrusive features, additional riverside planting and habitat creation. This has given rise to improvements elsewhere in the vicinity and pressure for further positive change.

The Grand Union Canal is an important water feature in the catchments. The London Canals Committee promotes landscape improvement and heritage along its route. The Brent Reservoir represents one of the most significant features in the Brent Catchment and creates a visually attractive landscape.

The landscape value of the open areas along the River Brent and Crane, and throughout the catchments, has been recognised by the local planning authorities. Designations and policy initiatives with landscape conservation and enhancement objectives include Green Belt, Metropolitan Open Land, Green Chains, Watling Chase Community Forest, Brent River Park and Crane Park.





KEY

	Catchment Plan boundary		Historic Parks and Gardens			
	Main River		Scheduled Ancient Monuments			
	Grand Union Canal					
	Urban Area					Scale (approx) 0 5 km
	Roads					



The northern part of the Brent catchment is designated Green Belt along with much of the River Crane corridor. The objective for the use of Green Belt to '*retain attractive landscapes, and enhance landscapes, near to where people live*' has been added to the recently revised government guidance on Green Belts (PPG2, January 1995). This gives greater weight to Green Belt's landscape value than previously afforded. Metropolitan Open Land (MOL) has a similar status and function to Green Belt, but within built up areas. Osterley Park and the River Brent corridor are both designated MOL.

In addition to Green Belt and MOL, the local planning authorities have identified Green Chains along much of the length of the Brent and Crane, as well as the Grand Union Canal, to reflect their landscape, ecological and recreational importance. The Walling Chase Community Forest extends into the northern part of the Brent catchment between Edgware, Borehamwood and Barnet. The community forest plan includes the aim to create an attractive, well wooded and diverse landscape as one of its objectives. Other Borough designations such as "areas of opportunity" have also been identified, many of which are along rivers, to promote environmental improvement and public access.

The map overleaf shows the location of scheduled ancient monuments (SAMs) and historic parks and gardens in the catchments. Features of particular heritage interest include the Grand Union Canal which has several SAMs along its length, including Hanwell Locks. Historic parks and gardens within the catchment include Osterley Park and Syon Park. Osterley Park includes a magnificent house set in extensive parkland dating from Elizabethan times, which is now owned by the National Trust. Syon Park lies near the catchments southern boundary, adjacent to the River Thames. The park is fed by the Duke of Northumberland's River.

In addition to SAMs, Archaeological Priority Areas and Archaeological Constraint Maps provide an additional sources of information on known archaeological sites. Archaeological Priority Areas are defined by English Heritage and are suggested to London Boroughs for inclusion in their UDP's. Archaeological Constraints Maps are prepared by the Museum of London by plotting SMR entries and some additional more recent sites/finds. These maps provide a supplement to the Archaeological Priority Areas and are held by Borough Planning Departments and English Heritage. There are Priority Areas identified throughout the catchments including areas in the vicinity of Syon Park, the Grand Union Canal and the Duke of Northumberland's River.

### *Future Situation*

New development will continue to be controlled by local planning authorities who should ensure that development respects, and where possible enhances, the landscape and preserves our heritage. Considerable improvements could be made in enhancing the catchments' riverine landscapes. Such improvements would require coordination of different agencies, a role the NRA is well placed to perform, and financial support. It is unlikely, however, that there will be fundamental change in the urban character found in these catchments. When opportunities for enhancement does arise, these should be taken up where feasible. **See Issue 4.3 - Channels and Flows pages 98 to 101 and Issue 4.6 - Litter page 106.**

### *Introduction*

In 1993, the Grand Union Canal (GUC) celebrated 200 years of history, since it's opening in 1793. Originally constructed for freight transport between London and Birmingham, the canal has seen many changes over this period, with the canal primarily being used as a recreational resource at the present time.

In 1829 the canal companies (whose canals made up the London to Birmingham route), amalgamated to form the Grand Union Canal, thus creating the longest single canal in the country stretching 145 miles from Brentford (London) to Salford Junction (Birmingham).

### *Current Situation*

British Waterways (BW) are the body responsible for managing the network of canals throughout Britain, which includes 2000 miles of navigable canals and rivers, and 90 feeder reservoirs, of which the Brent Reservoir used to be one. They are a public body responsible to the Department of the Environment and work in close co-operation with the NRA where their interests are shared. This is particularly true on the lower section of the River Brent, where the river is also the navigation channel.

Under the Transport Act 1968. Parliament divided canals and rivers into three categories depending on what they are used for and frequency of usage. These categories are:

- Cruising Waterways
- Commercial Waterways, and
- Remainder Waterways.

The GUC Main Line and Paddington Arm are classified as cruising waterways.

Since the 1968 Act, commercial traffic has decreased and the majority of boat movements are purely for recreation. Under the 1995 British Waterways Act, BW now have a duty to conserve and enhance the flora, fauna and natural beauty of sites through their operations. BW are currently preparing a Code of Practice to support these duties.

Within the Brent and Crane catchments, two stretches of the GUC - the Main Line and the Paddington Arm, flow through the lower reaches. The canal has a number of important historic features along its length. Brentford is the gateway to the whole canal network from tidal Thames. Historically, the area has been a network of wharves and docks important for boat building since it was opened in the 18th century. Of particular importance is the Brentford Island site, which since 1794, has acted as a focal point for international commercial trade. In recent years many of the traditional industries associated with the canal system have declined. BW are however looking at a series of options to revitalise this gateway to the canal network.



The GUC is used for both recreational and working boats and barges, but lack of local mooring facilities is a limitation on use. There are several boat yards on both the Main Line and Paddington Arms of the GUC. A feature of particular note is Hanwell Locks north of Brentford, which are Scheduled Ancient Monuments and include a flight of six locks which raise the canal by just over 53 feet. At the entrance to the Paddington Arm of the GUC stands Bulls Bridge which was completed in 1801. From the 1920's Bulls Bridge became the repair yard for the fleet of cargo-carrying boats of the newly created Grand Union Canal Company.

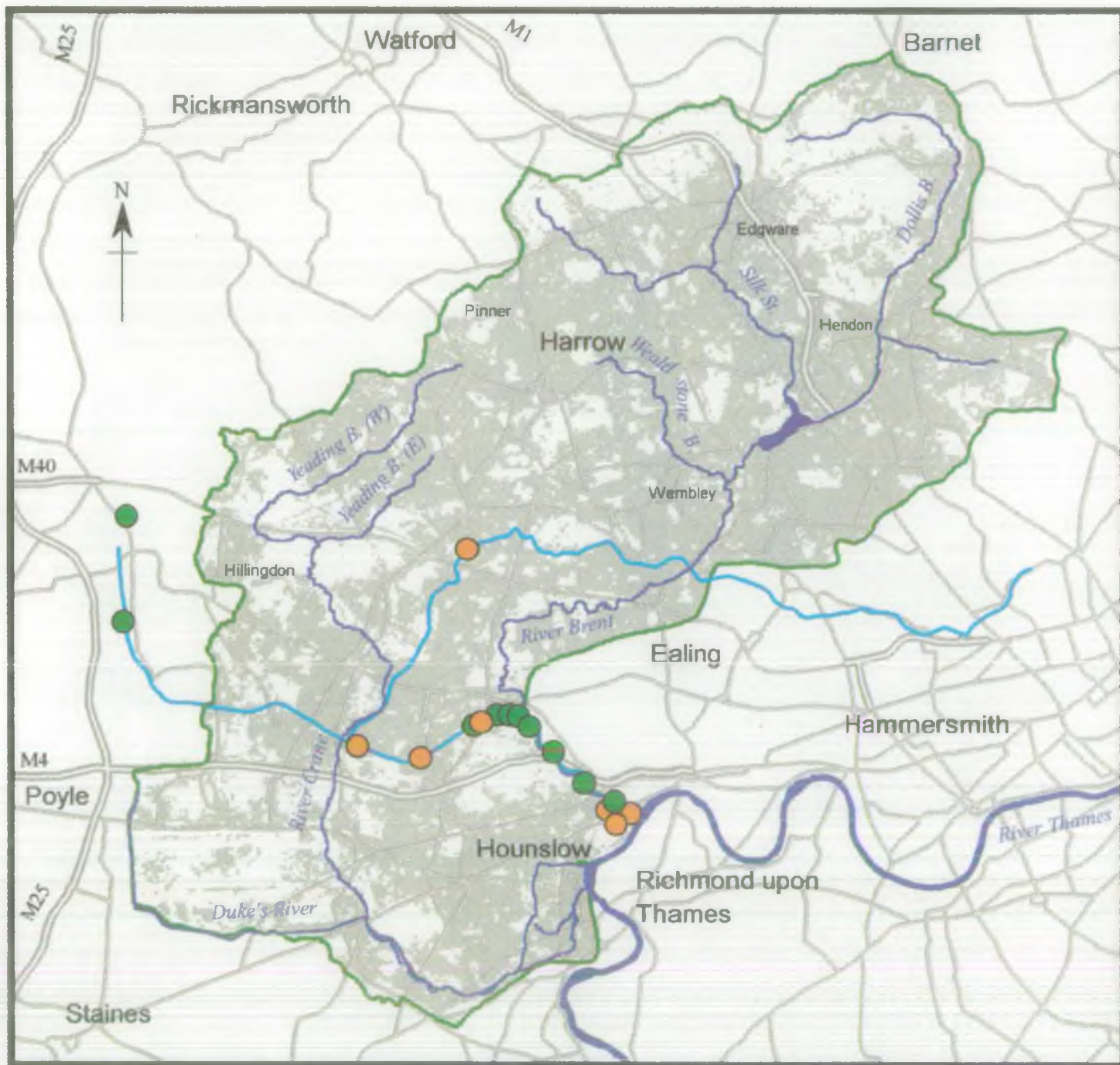
Boat movement records show that the canal is currently not well used. A lock counter at Hanwell Flight recorded 2500 boat movements in 1994. A total of 1088 movements were recorded between April and August 1995 at Thames Lock, near the confluence with the River Thames, and it is expected that the annual total will be no more than 1700 movements.

The GUC forms part of the West London Waterway Walks network, along which signs and interpretation panels are currently being installed. Ealing Canoe Club use the Grand Union Canal Paddington Arm at Horsenden Lane for placid water canoeing.

#### *Future Situation*

The historic nature of the GUC, its value as a recreational resource and its strategic importance to the rest of the navigation network, make the canal a unique feature. Consequently the NRA will support BW and local planning authorities in initiatives to improve and promote the use of the GUC for recreation, leisure and nature conservation consistent with the requirements for navigation. The NRA will also support the provision of additional moorings in appropriate sites. **See Issue 4.5 - Amenity and Recreation page 105.**





## KEY

	Catchment Plan Boundary		Lock			
	Main River		Boat yard			
	Grand Union Canal					
	Urban Area					
	Roads					
						Scale (approx)
						0  5 km

### *Introduction*

Changes in the age of retirement, more flexible working hours, unemployment and increased usage and ownership of cars over the last thirty years have seen an increase in time available for leisure and recreational pursuits. The water environment offers many amenity and recreational opportunities both in terms of formal activities, such as sailing, and informal activities such as walking.

The Brent and Crane rivers, their tributaries and associated canals form over 200 km of green corridors through west London. These routes provide a welcome natural element to what is otherwise an urban part of London. These routes often link with the parks and open spaces found beyond the river and canal corridors in the catchments.

### *Current Situation*

The West London Waterways Walks (WLWW) was established in 1990 and is supported by a partnership of London Boroughs, the Countryside Commission, London Canals Committee, NRA and British Waterways. The WLWW produced a report in 1992 which described actual and potential walks and identified constraints such as where natural access routes are blocked by obstructions. The vast majority of these routes follow the lines of the river corridors and seek to link areas of open space. The group has gone on to consider the formulation of policies for the future development and management of walks along the river and canal corridors in west London, which include the Thames, Brent, Crane, Colne, Pinn, Yeading Brook, Longford, Duke of Northumberland's River and the Grand Union Canal.

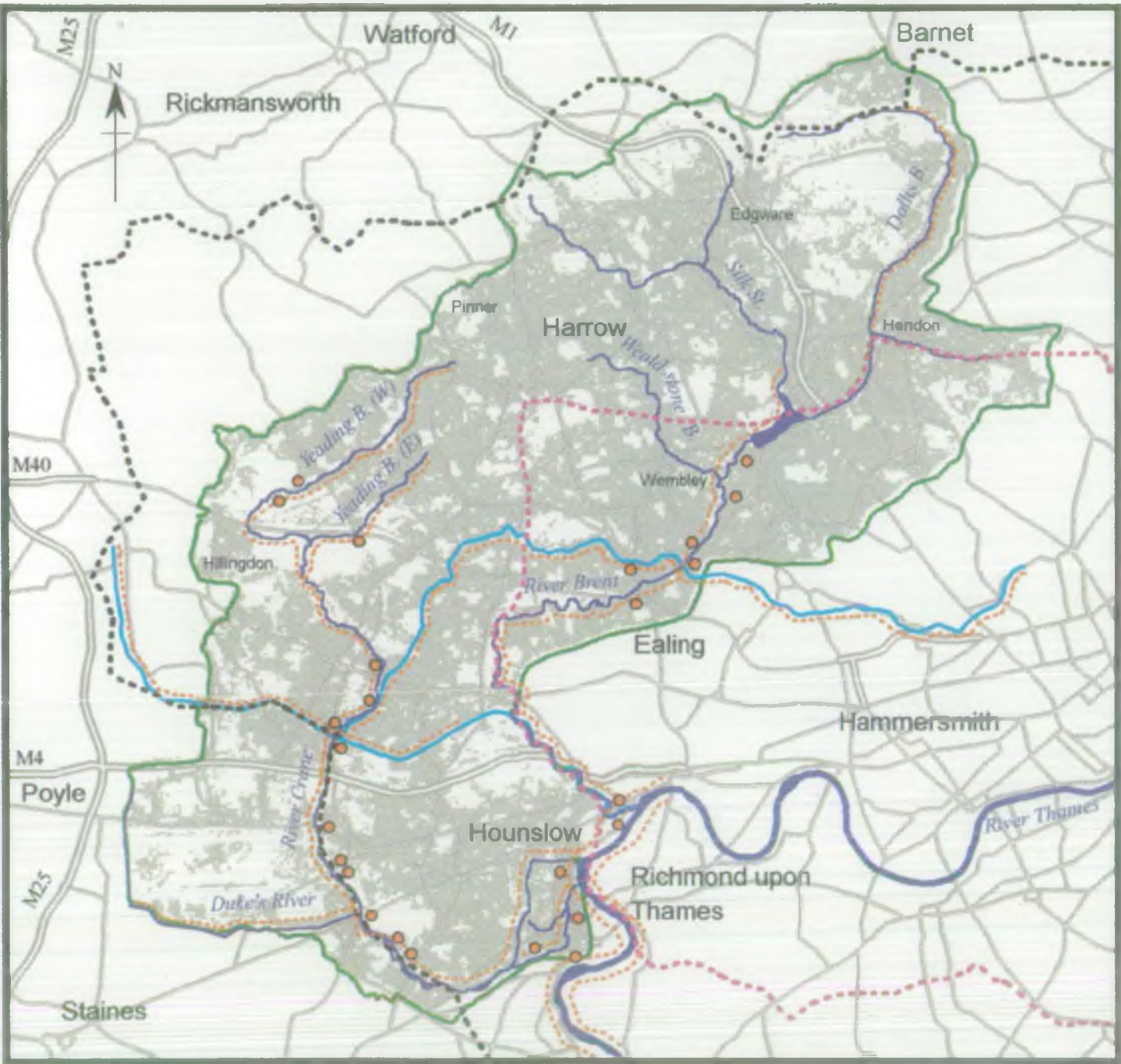
The London Boroughs of Ealing, Hounslow, Brent, Hillingdon and Richmond upon Thames are all committed to the WLWW project which has now progressed commitments through the planning process and raised its marketing profile. Clearly this initiative as a forerunner to similar projects presents all the agencies, including the NRA, with the challenge to respond to its aims and objectives when opportunities and resources are available.

The WLWW is part of the London Walking Forum, which are currently developing two orbital routes round London and address issues of management and recreation access London wide. The NRA also support the London Walking Forum.

In addition to forming part of the WLWW project, the Grand Union Canal within the catchments forms part of the Grand Union Canal Walk linking London and Birmingham launched by British Waterways.

Water based amenity and recreation within the catchments focuses on the Brent reservoir, which was constructed in 1835 for use as a water storage facility. Although the reservoir is recognised as a recreational asset for the area, there are several issues which influence its recreational potential, most notably the potential conflict with nature conservation. These issues are discussed further in Section 4.8. The reservoir is also important for informed recreation because of its nature history and conservation interest.





KEY

	Catchment Plan Boundary		Footpaths	London Walking Forum Routes	
	Main River		Obstructions to Riverside Footpaths		Inner Orbital Route
	Grand Union Canal		Brent Reservoir		Outer Orbital Route
	Urban Area				
	Roads				

Scale (approx)  
0 5 km



---

*Future Situation*

Brent Reservoir is a recreation asset to be valued. Its value is enhanced as there is a lack of alternative sites within the catchments for such activities as canoeing and other water sports. However, management of recreation in the future needs to continue to address conflicts with the reservoirs nature conservation importance. [See Issue 4.8 - Brent Reservoir page 109.](#)

Use should be made of interpretative information along the water courses of the catchments. This performs the dual role of educating users about the area, with regards to its ecology, history and conservation, and also encourages them to respect the needs of other users, helping them to co-exist. This process has already been started by the WLWW. [See Issue 4.7 - Information and Communication pages 107 and 108.](#)

The WLWW is currently developing four routes on the ground and two more are being planned. This initiative is showing the way forward in terms of access in this part of London and its work, along with that of the London Walking Forum, needs to be encouraged and supported. Particular attention in the future needs to be given to mitigating pathway obstructions. Accessibility to many more routes will be possible by clearing such obstacles. Improvements in water quality and channel flows would also have a knock-on effect on recreation, particularly on the River Brent. [See Issue 4.5 - Improvement of Recreational Facilities page 105.](#)

Investigation should be undertaken into the promotion of green chains and corridors. Using green space in between water features encourages the opening up of the wildlife areas within the catchments and promotes their enjoyment to a wider audience.

### *Introduction*

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 1960's and which are 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. Abstractions can vary in quantity from the very small amounts needed from a garden well to supply a single house, which may not require a licence, to the large quantities needed by public supplies and industry.

### *Current Situation*

There are no public water supply abstractions in the Brent and Crane catchments. The water that is abstracted is used predominately for industrial purposes, and because of the urbanised nature of the catchments only a small amount of water is used for agriculture and irrigation. Public Water supplies which come into the catchments are discuss in Section 3.2.

There are currently 13 licences in force within the Brent catchment (see Table 6). The major consumptive use of abstracted water is by industry including J Lyons & Co at their site in Greenford. The total quantity authorised for abstraction being 1,857,599 m<sup>3</sup> per annum of which 60% is derived from the chalk aquifer and the remainder from the Grand Union Canal. British Waterways hold several licences (on behalf of other abstractors) authorising abstraction from the Grand Union Canal. These are mostly for low loss cooling use.

There are 15 licences in force within the Crane catchment (see Table 6). The total quantity authorised for abstraction being 3,396,928 m<sup>3</sup> per annum the majority of which is derived from groundwater from the chalk (38%) and gravel (61%) aquifers. The major consumptive use of abstracted water is for industrial use, as in the Crane catchment, and includes the Thorn EMI and the Kodak sites. Other uses include spray irrigation, agriculture, cooling and British Airways' groundwater remediation exercise at Heathrow Airport to remove kerosene which has been spilled. Further, within this catchment, a large proportion of abstraction of water is for the washing of gravel, with mineral sites extracting material from the gravels at the lower end of the Crane catchment.

### *Future Situation*

The approach to water abstraction within the catchment in the future should be one which encompasses sustainable management of the water resources available. This should include close consideration being paid to any new application made for an abstraction licence.

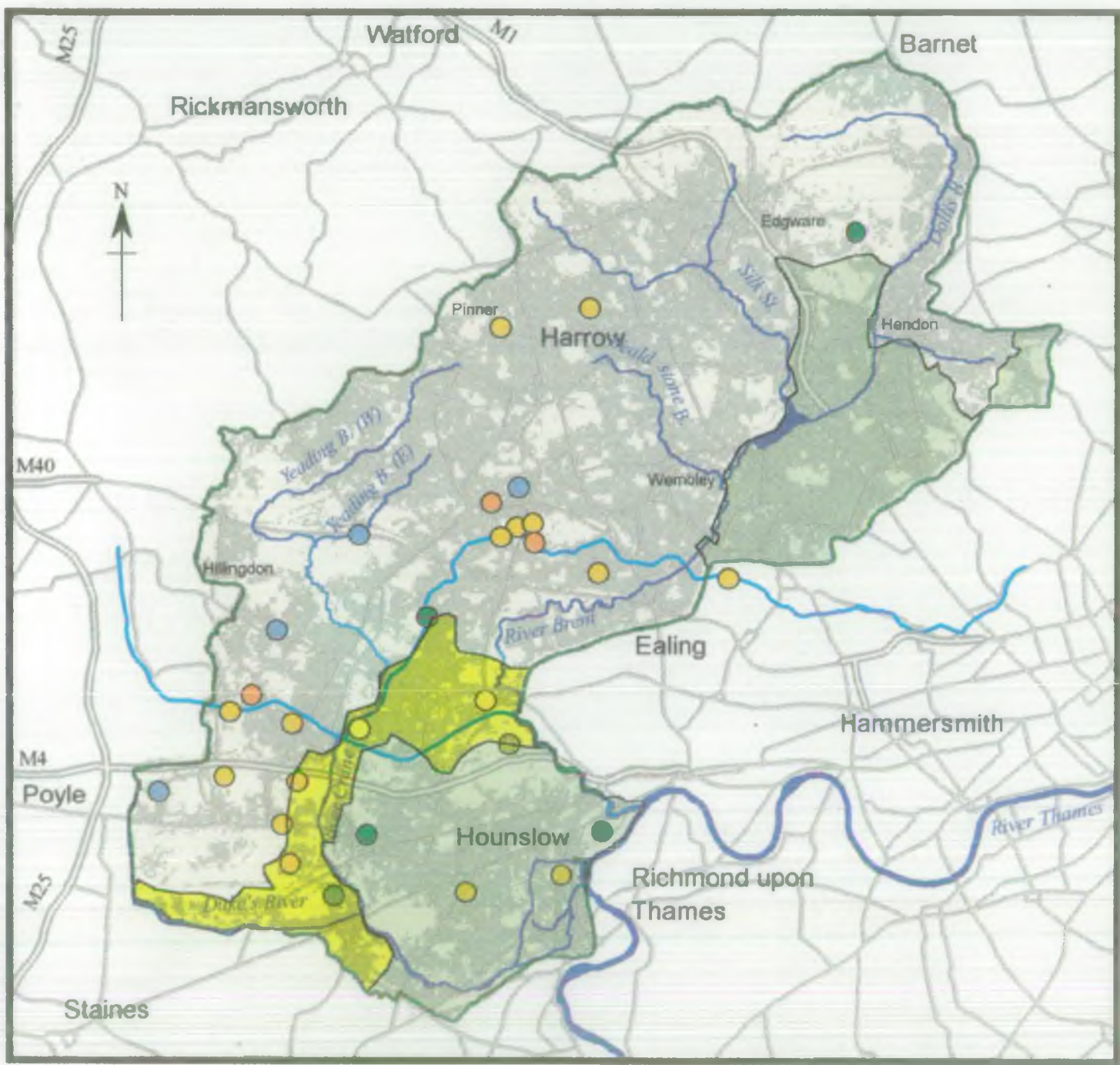
Although the London Main Ring is utilised by the catchment areas, it is envisaged within the NRA's document *"Thames 21 - A Planning Perspective and a Sustainable Strategy for the Thames Region"* (Sep' 1995) that areas within the catchments, fall into either one of two categories with regards the availability of water supply; Possible deficit 2015-2021, and Possible Local Deficit in Times of Peak Demand 2011-2021. This reinforces the point, that future management of water resources is vital to ensure water availability for future generations.

TABLE 6 : BRENT AND CRANE ABSTRACTIONS

BRENT CATCHMENT ABSTRACTIONS m <sup>3</sup> /year	
Public Water Supply	nil
Private Water Supply	83,156
Agriculture/Spray Irrigation	62,906
Industrial Process	700,675
Cooling	943,172
Fill & Maintain Ponds	1,000
Flow Augmentation	66,690
<b>TOTAL</b>	<b>1,857,599</b>
Sources:	
Chalk	1,114,658
Surface (non-tidal)	742,941
CRANE CATCHMENT ABSTRACTIONS m <sup>3</sup> /year	
Public Water Supply	nil
Private Water Supply	406,364
Agriculture/Spray Irrigation	217,489
Cooling/Dust Suppression	116,279
Industrial Process	720,980
Gravel Washing	1,298,636
Groundwater Remediation	637,180
<b>TOTAL</b>	<b>3,396,928</b>
Sources:	
Chalk	1,287,475
Gravel	2,069,542
Surface (non-tidal)	39,911



WATER ABSTRACTION LICENCES



KEY

Catchment Plan Boundary		WATER SUPPLY AREAS		LICENCED ABSTRACTIONS			
	Main River		Thames Water		Private Water Supply		Spray Irrigation/ Non - Agricultural
	Grand Union Canal		North Surrey		Industrial and Mineral Washing		
	Urban Area		Three Valleys		Water Transfer	Scale (approx) 0 5 km	
	Roads				Spray Irrigation / Agricultural		

### *Introduction*

Effluent is treated waste water from sewage treatment works or industry which is discharged into 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.

### *Current Situation*

There are four Thames Water Utilities sewage treatment works which serve the catchments. The vast majority of the sewage is treated at the Mogden works in Hounslow, with the extreme north eastern and eastern parts of the Brent catchment being served by the Deephams and Beckton sewage treatment works respectively and the extreme northern part of the Crane catchment being served by Maple Lodge sewage treatment works. All of these sewage treatment works discharge into rivers outside the catchments.

The outer areas of the Brent catchment near the Dollis Brook are relatively rural in nature and include properties not connected to mains sewerage. Their cesspools and septic tanks are generally old, poorly maintained and inadequate by today's standards. These present a potential risk to the water environment.

One of the problems that is facing the catchment is sewage entering into the river system. This is caused by a number of reasons:

- *Blockages in the sewerage network*
- *Domestic misconnections*
- *Lack of maintenance to the sewerage infrastructure*
- *Sewage overflows within drainage systems*

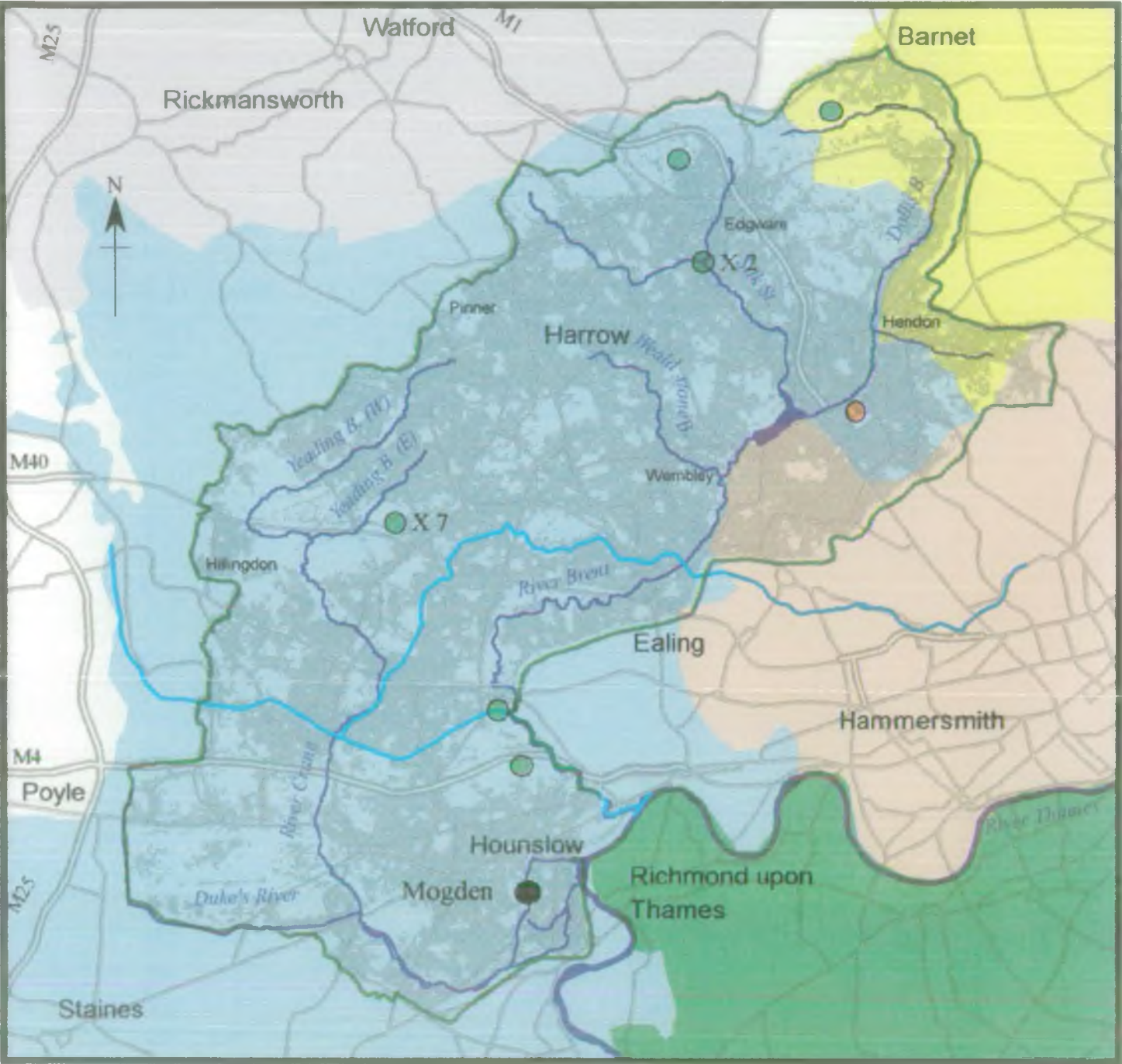
Whilst blockages within the system can be dealt with on a day to day basis, problems of misconnections and overflows will involve longer term planning and management by TWUL and the NRA.

### *Future Situation*

The challenge that faces both the NRA and TWUL is the problem of sewage entering the rivers. Negotiations are continuing under the Asset Management Plans (AMP2), approved by the Office of Water Services (OFWAT), to identify the priority sewer overflows which can be tackled. The NRA will continue to influence TWUL in developing its policy towards misconnections. The Wealdstone Brook and Mutton Brook could represent a potential study area for future investigations. See Issue 4.2 - Sewage page 94.



SEWERAGE AND EFFLUENT DISPOSAL



KEY

	Catchment Plan Boundary	Sewered Catchments				Consented Discharges	
	Main River		Decphams		Maple Lodge		NRA Monitored
	Grand Union Canal		Mogden		STW Location		HMIP Monitored
	Urban Area		Beckton			Scale (approx) 0 5 km	
	Roads		Crossness				

### *Introduction*

The use of land greatly influences the water environment. Urban development includes activities such as the construction of houses, shops, industrial units, roads, railways and airports. This type of development has the potential to have a detrimental impact on: the quality and quantity of surface water run-off; the diversity and range of river landscapes and habitats; and, the quality and availability of water resources. Local authorities and government departments develop policy and make decisions on the appropriateness of urban development. Rural land uses in the area are minimal and tend to be mostly recreational, with a very small amount of agricultural land. Good land management is vital for maintaining and improving the water environment.

### *URBAN DEVELOPMENT*

#### *Current Situation*

The catchments are characterized by extensive urban development. This pattern of development reflects the growth of London over the past 100 or more years, with the older development during the 19th and early 20th centuries being concentrated closer to central London.

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.

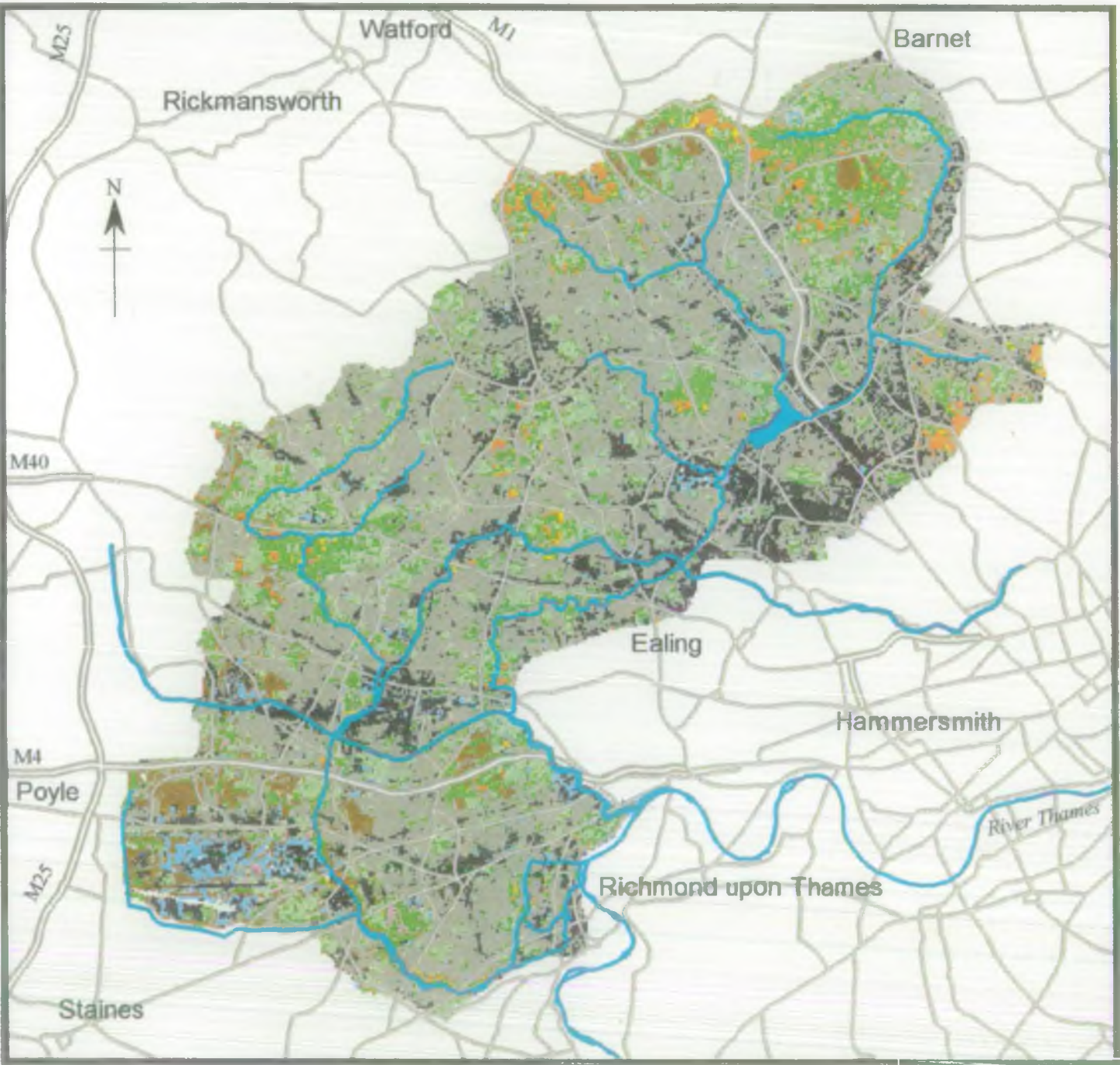
The main areas of London included within the catchments are Edgware, Hendon, Harrow, Wembley, Hillingdon, Hounslow, Ealing, Hayes, Southall, Kenton, Greenford and Northolt. Major road and rail corridors into London cross the catchments, including the M4, A40, M1, and the main rail lines from London to the South West, South Wales and the North West. The Crane catchment also includes Heathrow Airport and Northolt Aerodrome.

#### *Future Situation*

The recently produced NRA document "*Thames 21 - A Planning Perspective and a Sustainable Strategy for the Thames Region*" (September 1995), identifies areas of major development pressure and planning issues. Of particular note, is the possible expansion of Heathrow and the construction of Terminal Five, the development of Prospect Park, highway improvements including the widening of the M25, M4 and M40 and an additional spur road associated with Terminal Five. These developments all pose a possibility of pollution to the groundwater and surface water. Also, consideration must be given to retaining the capacity and natural flow routes of the flood plain. **See Issue 4.4 - Heathrow Airport page 102 and Drainage Policy page 104.**

There are a number of regeneration initiatives which may provide funding for development in the future. Sources of funding include: Europe; Central Government; and National Lottery funding. The Single Regeneration Budget (SRB) 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 the needs and priorities of the area. **See Issue 4.4 - Government and European Funding page 103.** There have been a number of SRB bids submitted within the catchments, which are highlighted in Table 7:





KEY

Land Cover					
Inland Waterway		Main River			
Grass/Heath		Grand Union Canal			
Mown/Grazed Turf		Roads			
Meadow/Verge/Semi Natural					
Rough Grass/Marsh					
Scrub/Orchard					
Deciduous Woodland					
Coniferous Woodland					
Tilled Land					
Ruderal Weed					
Suburban					
Urban					
Inland Bare Ground					
					Scale (approx)
					0 5 km

TABLE 7 - SRB BIDS FOR THE BRENT AND CRANE CATCHMENTS

Local Authority	Description	Outcome
LB Hillingdon	Hayes to West Drayton (regeneration and enhancement along the canal corridor)	Not determined
LB Barnet	Cricklewood/Brent Cross	Unsuccessful
LB Brent	Wembley Park Stadium	Not determined
LB Brent	Park Royal Partnership Project - seven year period	Successful
LB Hounslow	Brentford - £13.6 million for environmental and enhancement activities	Successful
LB Ealing	Havelock Community Regeneration project	Not determined

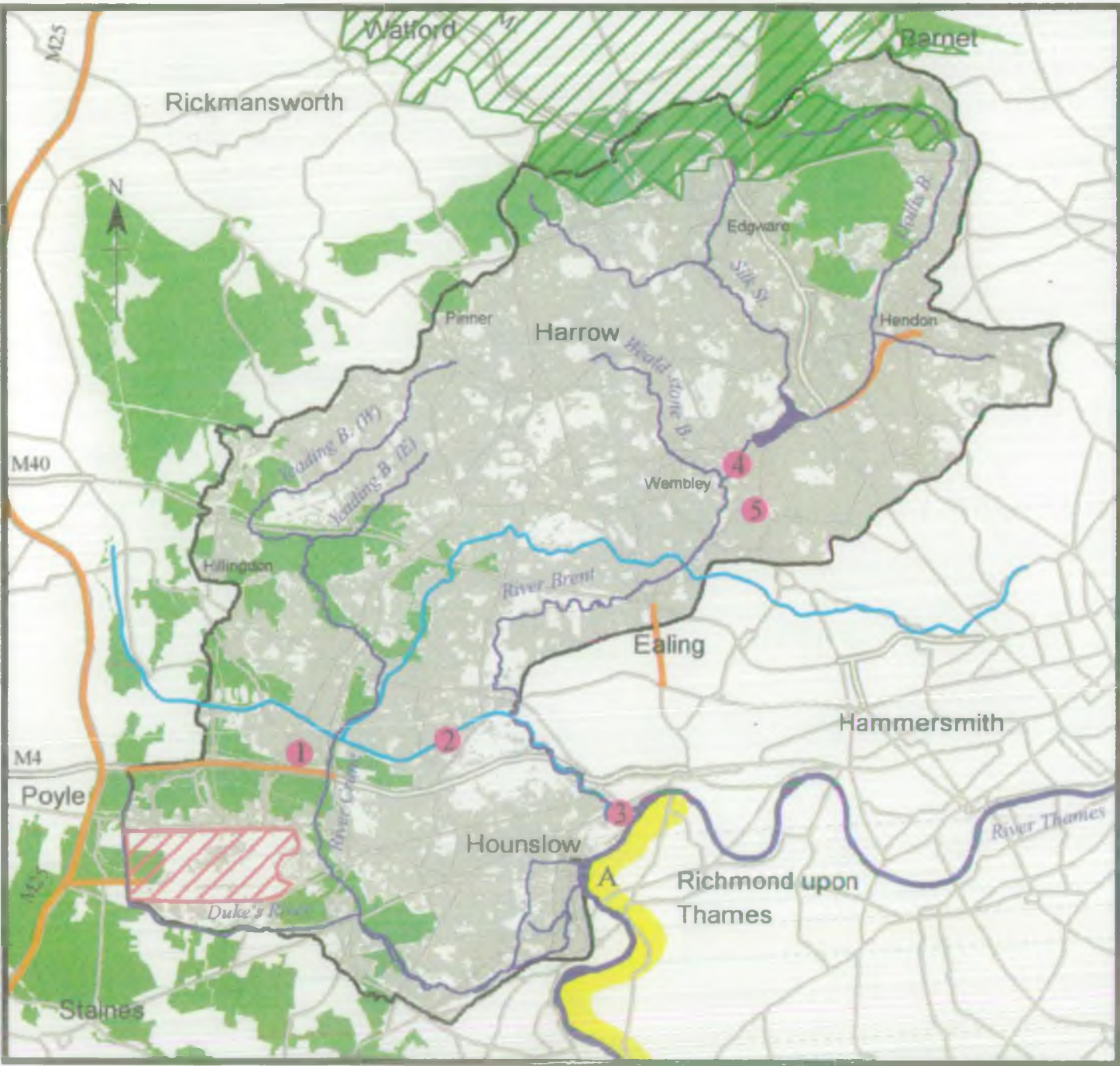
The Millennium fund is a potential source of funding for enhancement and regenerations schemes. The Millennium Commission is the body responsible for the allocation of these funds from the National Lottery. This type of funding is still a fairly new initiative, starting in November 1994, and details of bids for monies are not yet available. However, a possible recipient is the Thames Landscape Strategy which stretches between Hampton and Kew, and covers both the tidal Brent and Crane. Further, the London Borough of Hounslow are submitting a bid for Millennium funding, based on environmental sustainability themes. There has already been a successful SRB bid for Brentford for a programme of regeneration and environmental projects. It is expected that in future, opportunities for environmental enhancement will increasingly be through competitive partnership bids for funds.

Bids have also been placed for European LIFE funds. This includes a £1 million bid for the 1995-1996 funding period, by the London Walking Forum, for the development of walking through London including along towpaths and waterways.

Due to the catchments' urbanised nature, there is a distinct lack of available development land and as a result, the majority of development is by infilling. It is the responsibility of the local planning authorities to determine and monitor the location and occurrence of such infilling, but under certain circumstances eg. close proximity to a water course or impact on flood water storage capacity, the NRA (as a statutory consultee) is in a position to make comments on such developments. However, with regards to the major schemes which are planned for the catchment, the NRA once again has the right to make comment, and as these are of a limited number, they are listed below:

- Wembley Stadium
- St Margarets Road, Ealing
- Bentley Priory
- Brent Cross
- BWB Land and Brentford Lock
- Bedfont Lakes
- RAF Stanmore
- The Royal Orthopaedic Hospital, Harrow
- Terminal Five - Heathrow





KEY

	Catchment Plan Boundary		Green Belt		SRB Projects		Millenium Projects
	Main River		Community Forest	1. SRB - Hayes to West Drayton		A	Hampton to Kew
	Grand Union Canal		Proposed Airport Expansion	2. SRB - Havelock Community Regeneration Project			
	Urban Area		Major Road Improvement Schemes	3. SRB - Brentford		<div>Scale (approx)</div> <div>0 5 km</div>	
	Roads			4. SRB - Wembley Stadium			
				5. SRB - Park Royal			

**RURAL DEVELOPMENT****Current Situation**

The area covered by the catchments is predominantly urban as Table 8 shows. However, 3,447ha (1.3% of the total catchment area) is in agricultural use and the importance of such land locally, is not only for its economic value but also for its visual and landscape importance.

**TABLE 8 - RURAL LAND USES WITHIN THE CATCHMENTS**

Land Use	Area (ha)
Grassland	2000
Rough Grazing	408
Crops and Fallow	708
Farm Woodland	116
Other Land	123
Set-Aside	92
<b>TOTAL</b>	<b>3,447</b>

Over the last decade the area of cropped land has been very stable with only 0.6% decrease in area despite the overall agricultural area decreasing by 9.1%. Since the introduction of the Common Agricultural Policy (CAP) Reform in 1992, all but the smallest farms have been required to set aside a minimum of 15% of land growing cereals, oilseed and protein crops in order to receive Arable Area Payments (APPS). The purpose of this is to reduce over-production of certain crops and to balance supply with demand. It is deliberately flexible and is designed to take account of changing circumstances. Thus, for example, the amount of set-aside land required under AAPs may be reduced for the 1995/96 year. On such land, (92 ha in 1994) agricultural crops for food production can not be grown for the duration of the set-aside period. In addition farmers are not allowed to apply artificial fertilisers or pesticides apart from non-residual herbicides.

There is a total of 110 holdings in the catchment areas, of which 60 (or 54%) are part-time holdings. The majority of the holdings are very small, with 45 being less than 5 ha and only 30 being greater than 5 ha. Such a pattern of farm size is very typical of land tenure close to an urban area.

**Future Situation**

Within the agricultural sector, there is tending to be a movement away from traditional techniques (eg. dairy and arable farming). More emphasis is now being placed on new ideas and alternative products, which is expected to continue in the future. This is in line with European initiatives to decrease wastage. Schemes to be considered for future designations include:

- Organic Aid Scheme
- Habitat Scheme (5 year)
- Farm & Conservation Grant Scheme
- Countryside Access Scheme
- Farm Woodland Premium Scheme
- Countrywide Stewardship



### Introduction

The National Rivers Authority has a clear aim *"to provide an effective defence for people and property against flooding from rivers and the sea"*. This means that the NRA can exercise powers to provide effective flood defences on main rivers, and local authorities can similarly do so for ordinary watercourses within the catchments.

The NRA powers to undertake maintenance are permissive only, not mandatory, and can be used on those watercourses designated as main river. The NRA uses these powers to carry out works to reduce flood risk, and exercises them according to available resources and priorities. Such maintenance works include vegetation control obstruction and blockage removal and dredging. Maintenance of the integrity of the banks themselves is the responsibility of the riparian owner. The regime of maintenance which has been undertaken can contribute significantly to reducing the risk of flooding. At times of heavy rainfall operational priorities are to check river control structures and clear debris and identified obstructions where possible.

### Current Situation

Within both the Brent and Crane catchments the threat from flooding is primarily as a result of the urbanised nature of the area, and the speed at which run-off from hard surfaces flows into watercourses. Problems are also experienced through the amount of rubbish and litter that is present in the rivers. [See Issue 4.6 - Litter page 106.](#)

The main problem of flooding is found in the higher part of the Brent catchment, above the Brent Reservoir. The Edgware Brook, Silk Stream, Edgwarebury Brook and Deans Brook have particular problems, with the last serious flooding taking place in 1992, and prior to that in 1982. The NRA, in conjunction with the London Boroughs of Barnet and Harrow, are currently carrying out a feasibility study to look at the various options, in order to alleviate the risk of flooding in this area. Downstream of the Brent Reservoir, flooding issues are not as frequent, primarily due to the extensive channel widening works undertaken by the NRA's predecessors during the late 1980's. [See Issue 4.9 - Flooding page 111.](#)

One particular feature which is of note within the Brent catchment is the Brent Reservoir. The Brent Reservoir was constructed in 1835 to provide a water supply for the Grand Union Canal. Whilst British Waterways still own this structure, the reservoir's primary operational purpose is as a storage reservoir for flood water attenuation. BW only discharge a modest flow from the reservoir to the canal because they now use a supply from the River Colne at Uxbridge. The level in the Brent Reservoir is kept artificially low as part of a British Waterways/NRA agreement made by these organisations predecessors in the 1940's. This agreement relates also to British Waterways right of supply from the Colne at Uxbridge. [See Issue 4.8 - Brent Reservoir page 109.](#)

The Grand Union Canal for most of its length within the catchments, apart from between Norwood Top Lock and the River Thames, receives substantial inflow from surface water drainage. The canal acts as balancing storage and attenuates the discharges it receives. It should be noted that any improvements in the future to canal overflow weirs may contribute additional flows to receiving watercourses and rivers.

Whilst the Crane catchment is heavily urbanised, it has not suffered to the same extent as the Brent catchment in terms of flooding problems. However certain alleviation schemes have proved necessary. The NRA has recently completed works on both the East and West branches of the Yeading Brook and also at the mouth of the River Crane, where it meets the River Thames. See Issue 4.9 - Provision of New Flood Alleviation Works page 112.

Whilst the NRA does not normally own main rivers, the majority of the Duke of Northumberland's River is an exception to this rule. The watercourse was originally constructed to provide water for the Duke's private estate at Syon Park, on the River Thames, and therefore differs from the natural rivers within the catchment. Flowing through Heathrow Airport, part of the river is at risk of being culverted. See Issue 4.4 - Heathrow Airport page 102. In respect of flooding, the Duke's River does suffer from some problems. It is perhaps one of the better rivers in ecological terms within the catchments.

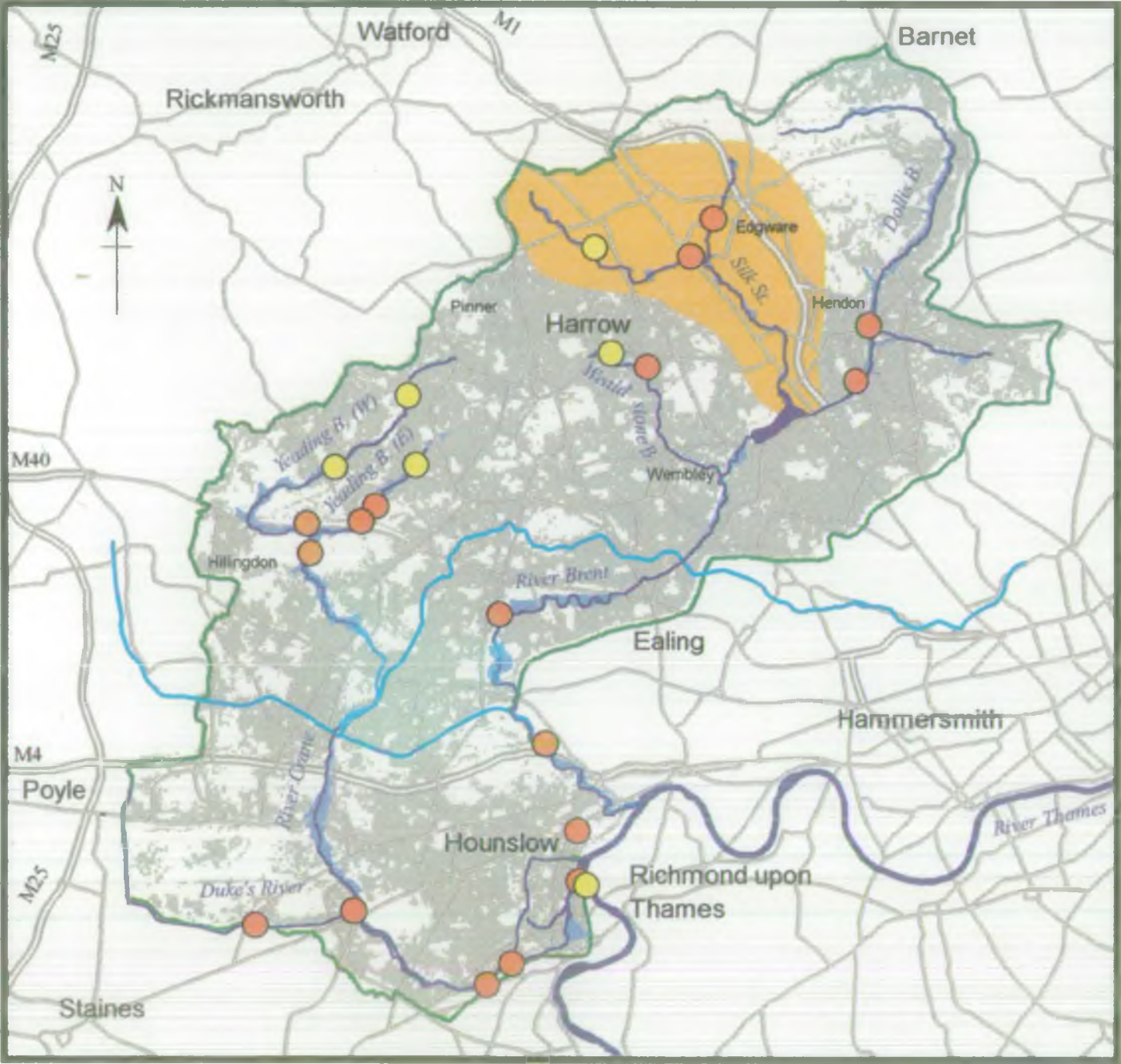
Ordinary watercourses within the catchments also present their own particular problems. The responsibility for the network of streams that flow into the main rivers lies with local authorities. Consequently the level of maintenance and upkeep of streams is a matter for local authorities to prioritise. See Issue 4.9 - Main River Revisions page 110 and Maintenance Works page 113. However, these watercourses are still subject to the same pressure from urbanisation as the main rivers within the catchments. Two specific examples highlight this problem.

The Edgwarebury Brook has received a great deal of public attention because of its flooding problems, and forms part of the joint feasibility study being undertaken at present by this Authority and the London Borough of Barnet. The Wembley Brook on the other hand is partially culverted, is constantly being filled with fly tipping and consequently has a number of pollution problems. These watercourses form part of the catchment and have an impact on the overall quality of the water environment. See Issue 4.9 - Provision of New Flood Alleviation Works page 112.










Within the catchments, the NRA have adopted a policy to deal with surface water run-off from new development. The urbanised nature of the area results in rainfall travelling quickly into the surface water sewers and gulleys, and eventually into the rivers. This in turn causes water levels to rise very quickly leading to the increased threat of flooding.

In an attempt to combat this threat, this Authority has introduced a three zone approach to dealing with surface water run-off (see the surface water run-off strategy map). Within the red zone at the top of the catchments every attempt should be made to store as much water as possible from reaching the rivers and managing its discharge. However, for development within the green zone disposal of water directly into the river system or by managed discharge following storage will be acceptable. This strategy has been adopted by some of the local authorities within their development plans and has helped to reduce the impact of surface water run-off. See Issue 4.4 - Drainage Policy page 104.





KEY

	Catchment Plan Boundary		Areas at Flood Risk (Modelled Flood Plain)			
	Main River		Flood Defence Structures			
	Grand Union Canal		River Level Warning Stations (Watchdogs)			
	Urban Area		Edgware / Silk Stream Feasibility Study			
	Roads					
						Scale (approx) 0 5 km

### *Flood Warning*

The NRA recognises that irrespective of attempts to minimise the risk from flooding through the implementation of various policies and actions, it can occur and on occasion represents a risk to human life. With regard to public safety the NRA operates a flood forecasting service in the catchment which uses relayed rain gauge and river level data from a number of sites, radar and rainfall forecast data from Bracknell Meteorological Office, and information from flood defence staff in the field.

Flood warnings are issued by the NRA via public media such as local radio and ceefax, also to the police and local authorities to enable them to take precautionary action when floods are threatened. Annual flood warning seminars are also held to review the effectiveness of the flood forecasting and warning process.

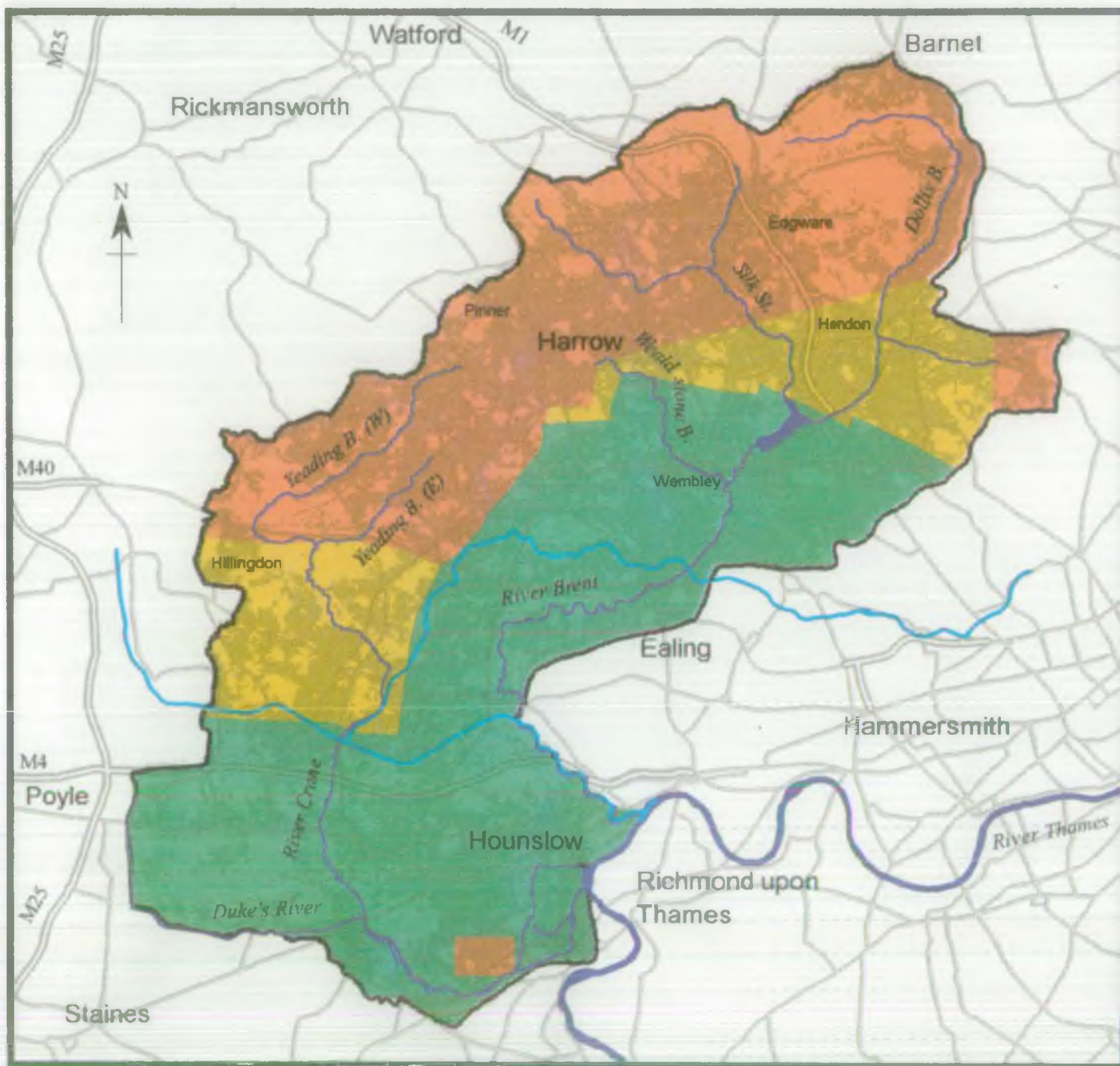
In order to ensure that timely warnings are issued to the right people, the NRA operates a system of Flood Warning Standards of Service. By defining lengths of river, or reaches, with common land use interests, those areas with a high population concentration can be treated as a priority. It is our aim to provide a two hour warning of commencement of flooding.

The NRA is often considered by the public to be the agency to contact when a flooding problem occurs, however once warnings have been issued, the NRA's prime objectives are efficient operation of control mechanisms, ensuring rivers flow as freely as possible and monitoring developments. London Boroughs have permissive powers to offer assistance during floods. This may include placing sandbags, moving possessions, evacuating people. The fire service provide help in flood emergencies if they are able to do so. The boroughs are also responsible for public highways and would deal with any flooding problems associated with road drainage. Public surface water sewerage systems are the responsibility of Thames Water Utilities Ltd, who may sometimes use boroughs as their agents.









### *Future Situation*

The NRA will continue to meet its flood defence obligations and investigate the feasibility of carrying out further flood defence works. The feasibility study currently being undertaken with the London Boroughs of Barnet will be taken forward as necessary by the NRA. The NRA will continue to work closely with local planning authorities to promote their flood defence interests to counter the threat of increased flood risk, arising as a result of development. See Issue 4.9 - Management of Flood Risk pages 110 to 113 and Issue 4.4 Drainage Policy page 104.





## KEY

	Catchment Plan Boundary	Surface Water Runoff Control Areas			
	Main River		Additional Run-off to be Stored		
	Grand Union Canal		Additional Run-off Storage may be Required		
	Urban Area		Additional Run-off Storage not Required		
	Roads				

Scale (approx)  
0 5 km



### *Introduction*

Mineral extraction has the potential to alter the quality and quantity of flow in rivers and aquifers. Having extracted the mineral deposits, sites are frequently used for solid waste disposal. A valid planning permission and in most cases a licence from the Waste Regulation Authority is required for disposal of waste, these contains conditions controlling how the site is designed, operated, maintained and restored so as to prevent pollution of the environment, danger to public health and detrimental to local amenities.

Past mineral extraction and tipping in west London has left numerous landfill sites dating from around Victorian times, when waste was carried on barges out of London to more contemporary landfills that were subsequently absorbed into the conurbation. For various reasons the landfill of household and other biodegradable wastes in the area has now largely ceased and the area is now a net waste exporter, mainly by road and rail to large landfills in the shire counties.

### *Current Situation*

Whilst historically mineral extraction has taken place at the lower end of both the catchments, there are only a few known workings taking place at the present time. Due to the pressures placed upon land for development, land for mineral extraction is unlikely to be a problem facing the water environment in the future.

With certain exceptions, waste management activities in Greater London are supervised by the London Waste Regulation Authority (LWRA). Certain prescribed activities are authorised by HMIP under Integrated Pollution Control. The LWRA exercises a regulatory role over waste producers (through the Duty of Care, Section 34 of the 1990 Act), carriers of waste (through the Control of Pollution (Amendments) Act 1989) and disposers through waste management licensing, inspection and enforcement. It also has a statutory responsibilities for waste planning in London and for supervising the documentation procedures regarding Special Wastes.

Due to the sheer quantity of waste that London produces, increasing pressure has been placed upon the capital to reduce the amount of waste it is producing and to look at alternative methods of dealing with waste arisings. Consequently the LWRA in it's "Waste Disposal Plan for Greater London - 1994", has adopted the philosophy of *"recycling, re-using and reduction"* to tackle this particular problem. Incineration has also been identified as one method of reducing the future demand for landfill.

Incineration provides a number of potential concerns for this authority, including the disposal of residual material and the use of river water for cooling and washing purposes. However, all waste disposal options have limitations and it is necessary to evaluate all alternatives objectively and decide on the Best Practical Environmental Option (BPEO). Within the Brent and Crane catchments there are no large industrial incinerators for dealing with waste arisings, but there are a number of small incinerators designed to deal with site specific waste such as clinical waste. The clinical waste incinerators at Northwick Park and Hillingdon hospitals are HMIP authorised, and are thus small by municipal waste incineration standards, but of the larger size for clinical waste.



As stated above, there are many old landfill sites located in the catchments. These are just one type of potentially contaminated land that occurs in the catchments. The LWRA receives many enquiries regarding contaminated sites and the disposal of soils arising from construction works. There is effectively no outlet for bulk contaminated wastes in this area of London and disposal is therefore expensive, with the consequent opportunity for abuse and pollution.

British Waterways undertake dredging of canals which is an important activity for the sustainable use of the canal system. The disposal of canal dredgings, and river dredgings generated from works by the NRA, require disposal at a licenced site. Minet tip, opposite Southall Gasworks, has recently been licenced for this purpose.

#### *Future Situation*

It is unlikely that the catchments will be subject to increased mineral extraction in the future. However, the problem of dealing with waste disposal within London is an issue that will develop over the next decade.

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



### Surface Water

The principal aim of the NRA water quality function 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.

The NRA uses two schemes for the reporting and management of river water quality: the general quality assessment (GQA) scheme, and the water quality objectives (WQO) scheme, which is used to set water quality objectives based on uses.

#### *General Quality Assessment*

The GQA scheme is used to make regular assessments of the quality of rivers, to monitor trends over time and to compare rivers in different areas. Four components are being developed for the GQA assessment - general chemistry, nutrients, aesthetics and biology - each providing a discrete "window" on the quality of the river stretches. The general chemistry component of the GQA is now in use. It is made up of six grades defined by standards for Dissolved Oxygen, Biochemical Oxygen Demand (BOD) and Total Ammonia (see Appendix III). The remaining three windows are still under development and will be applied when available. The GQA chemical quality of watercourses in the Brent and Crane catchment is shown on the map opposite.

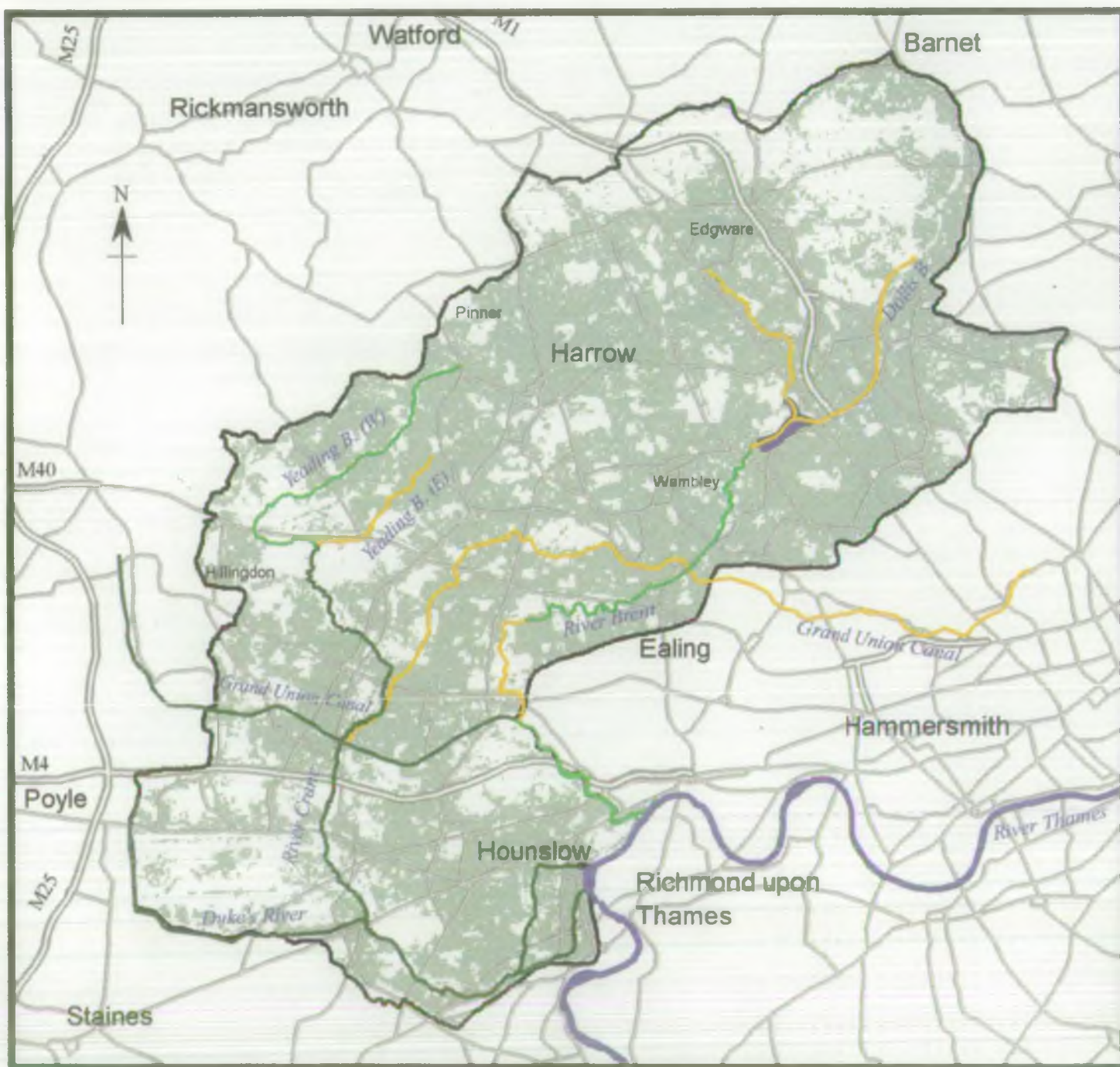
#### *Water Quality Objectives*

The WQO scheme establishes quality targets based on the uses of the watercourse, to provide a commonly agreed planning framework for regulatory bodies and dischargers. The proposed WQO scheme is based upon the recognised uses to which a river stretch may be put. These uses could eventually include: River Ecosystem, Special Ecosystem, Abstraction for Potable Supply, Agricultural/Industrial Abstraction and Watersports. The standards defining the five 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. For each stretch of river, an RE class WQO 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 with appropriate RE classes and target dates, that is, dates when the objectives are to be achieved.

The WQO scheme also allows for long-term objectives. These are objectives which we hope to attain beyond the next ten years. In order to set long-term objectives it is important to determine the need for further water quality improvements within the catchment. A public view on the required uses for a watercourse would be valued (eg. if a river does not currently support a fishery and the public feels it should support a cyprinid fishery). **It is hoped that the public will take the opportunity presented by this CMP consultation document to express any views they have on present and potential river uses in this catchment.**



# WATER QUALITY : GENERAL QUALITY ASSESSMENT (GQA)



## KEY

	Catchment Plan Boundary	GQA (1992 - 1994)			
	Urban Area		Class C		
	Roads		Class D		
			Class E		
				Scale (approx)	
				0  5 km	



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 therefore important to relate the cost of any proposed improvements to their benefits, when deciding on whether or not individual schemes should go ahead. Cost benefit analyses will also be used in helping to assign priorities for improvement schemes.

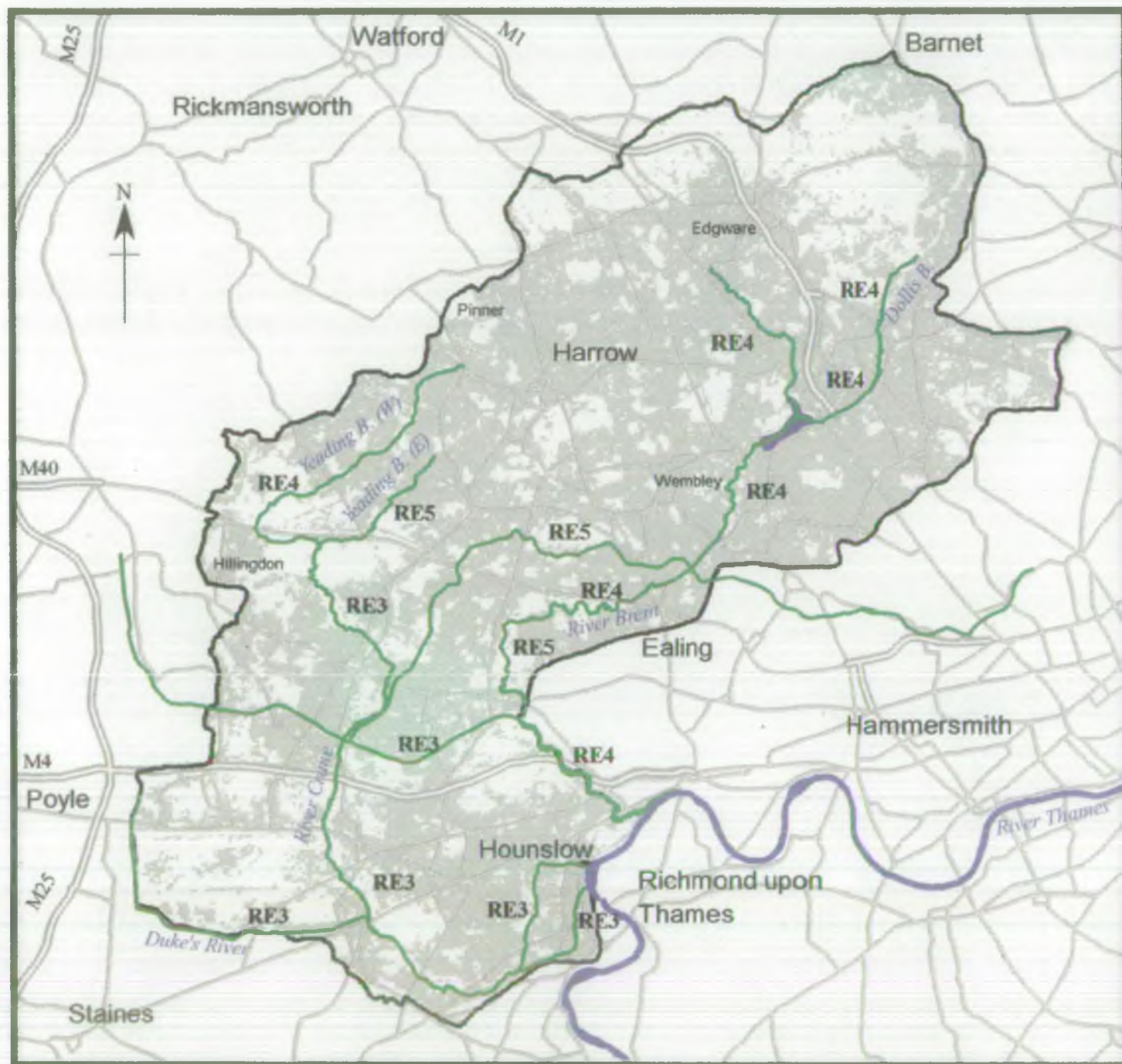
**TABLE 9 : DESCRIPTION OF THE FIVE RIVER ECOSYSTEM CLASSES**

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.
	<b>Chemical standards have been derived for each of these classes and details of these standards are given in Appendix III.</b>

The new River Ecosystem classes above were used to set river quality objectives for the Brent and Crane catchments. The results are shown on the map opposite. The water quality objectives have been set, taking into account current and future uses of the watercourses in this catchment. The compliance of watercourse reaches, with their objectives, is judged against a rolling, three calendar year period. In this report, compliance was judged using the years 1992 to 1994. All the reaches in this catchment currently meet the proposed short-term river quality objectives.

The objectives have been set by the NRA but are not yet statutory. The statutory scheme will require public consultation. These objectives are to assist the NRA in planning work until they become statutory. Since the system is new, several of the objectives may need to be reset as further information on the watercourses is gathered. This will be done over the next few years, before statutory objectives are implemented. Once the objectives become statutory, the NRA will review them at least once every five years. It should be noted that RE classes will not necessarily relate to the health of the fish populations in these reaches.

# WATER QUALITY : COMPLIANCE WITH SHORT-TERM RQOs



## KEY

	Catchment Plan Boundary	Compliant with Objectives			
		Proposed Water Quality Objectives 1992-1994			
	Urban Area		Compliance Achieved	RE3	Short Term RQO
	Roads				

Scale (approx)

0 5 km



### *Biological Quality*

The health of rivers is reflected in the variety and abundance of the 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 (examples include larvae of insects such as mayflies, caddisflies and dragonflies together with snails, crustaceans, worms and many other groups) which live in the sediments of rivers or amongst aquatic vegetation. Biological monitoring provides a useful measurement of water quality because macroinvertebrates are continuously exposed to changes in water quality and communities respond to both intermittent and low level pollutants, which often remain undetected by standard chemical methods.

Biological assessments are made at sites which complement chemical monitoring programmes. Where necessary, further spatial coverage is provided by more detailed surveys of individual catchments, timed to coincide with CMP production. Biologists also examine the ecological effects of significant pollution incidents and monitor long term trends in biological quality. Standard sampling methods used by the NRA have been developed in collaboration with the Institute of Freshwater Ecology (IFE).

The biological quality of a site is shown by the variety of different macroinvertebrate taxa (groups of fauna) present and by their individual susceptibility to pollution. This is measured by using the Biological Monitoring Working Party (BMWP) score system. This system was first used for the 1980 Water Quality Survey of England and Wales and is widely accepted as a simple, but effective, means of assessing biological water quality. The BMWP system allocates a score to each macroinvertebrate taxon, based on its tolerance to organic pollution. The total BMWP score for a site is calculated by summing the values of each taxon found in a sample. Within the Thames Basin BMWP scores above 100, generally indicate good biological quality, whilst scores below 20 occur at the most polluted sites.

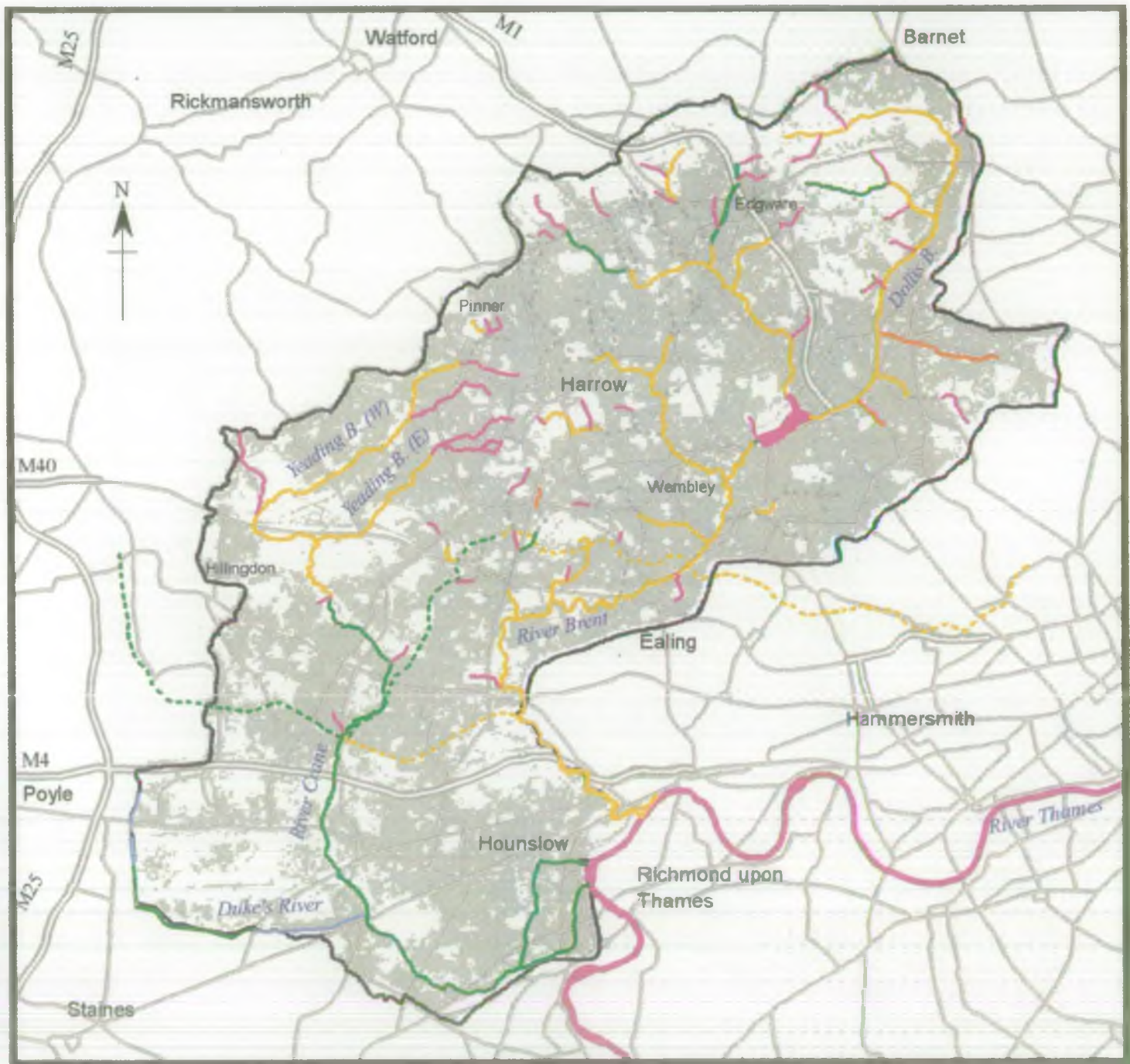
BMWP scores are reduced by poor water quality, which selectively excludes pollution sensitive taxa. Other influences, which serve to reduce the variety of taxa present, but not in a selective way, include limited habitat provision in degraded channels and natural differences in biological potential associated with various watercourse types. The Average Score Per Taxa (ASPT) is a particularly useful index of organic pollution, which focuses solely on the balance between sensitive and tolerant taxa. As a result, it is relatively unaffected by habitat or other non-specific influences. ASPT is calculated by dividing the BMWP score by the number of BMWP scoring taxa. Within the Thames basin ASPTs below 3 are found at the most polluted sites whilst values nearer 5 occur if water quality is good.

### *Current Biological Status*











The average BMWP results obtained at sites during 1992-94 are represented on the map opposite. Appendix III provides a table summarising the current and historical BMWP and ASPT scores obtained at sites.



WATER QUALITY :  
BIOLOGICAL STATUS



KEY •

	Catchment Plan Boundary	Mean BMWP Score (1992-94)				
			B Good (101 - 150)		Not Sampled	
	Urban Area		C Fair (51-100)		Grand Union Canal	
	Roads		D Poor (21-50)		Culverted Watercourses	
			E Very Poor (0-20)			
						Scale (approx) 0 5 km



The biological quality of the River Brent, and its tributaries, is overwhelmingly poor (BMWP 21-50) or very poor (BMWP 0-20). Macroinvertebrate communities are mostly restricted to assemblages of pollution-tolerant groups such as snails, leeches, midge larvae and worms, characteristic of organic pollution. This situation is shown by particularly low BMWP scores (usually in the range 15-30) and ASPTs (2.5-3.2) (Appendix III). The current biological status of the catchment reflects the impact of urbanisation upon water quality. With the poorest tributaries tending to be the most heavily culverted streams. These streams receive large volumes of polluted run-off derived from diffuse pollution sources, such as domestic sewer misconnections or minor pollution incidents which have a cumulative impact upon water quality. See Issue 4.2 - Sewage page 94. Local sections of fair biological quality (BMWP 51-100) occur only in a short length of the Brent, below the Welsh Harp Reservoir and in several tributary streams draining less populated surroundings. These locations support a modest variety of macroinvertebrates, including some taxa characteristic of cleaner water.

The River Crane and its tributaries, is mostly of fair quality, with localised sections of good biological quality. Poor biological quality is confined to the two arms of the Yeading Brook (Yeading East and West), with BMWP scores improving steadily below the confluence of these two arms. Downstream, the River Crane and Yeading Brook has recovered from a serious chemical pollution in 1990 and now supports a healthy mixture of animals from a variety of groups. There is evidence to suggest that biological quality has improved in recent years in this river, as relatively sensitive damselflies, caddisflies and mayflies are now found. The Duke of Northumberland's River supports the most diverse macroinvertebrate assemblages in the Brent and Crane catchment, containing a number of caddisflies, dragonflies and mayflies, characteristic of good water quality, particularly in the upper section. Biological quality is reduced by limited habitat provision in several sections of this river in the vicinity of Heathrow Airport. See Issue 4.4 - Heathrow Airport page 102.

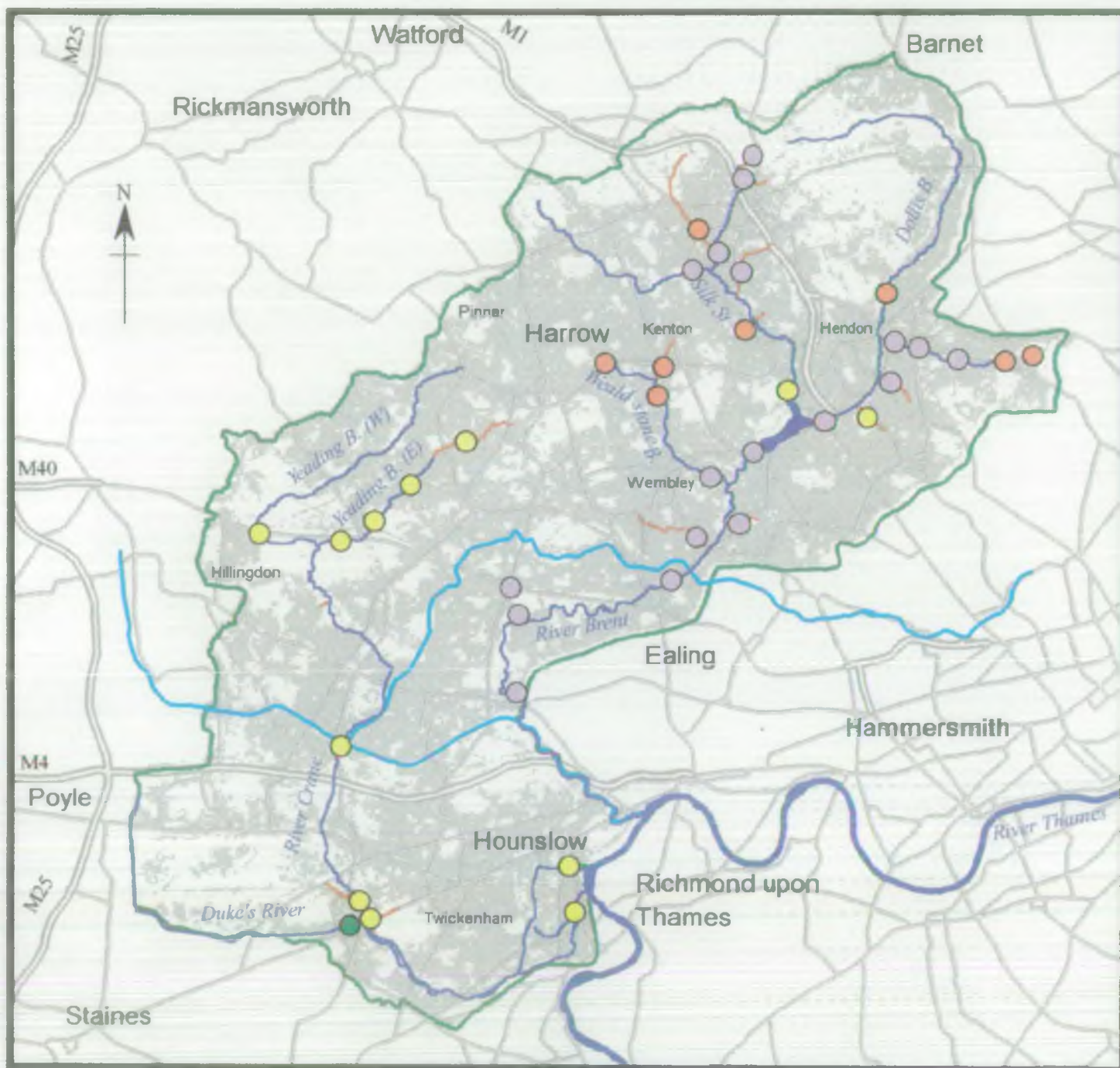
The Grand Union Canal (Cowley Reach) supports a good biological quality and contains a wide variety of taxa, characteristic of still or slow flowing water, particularly where sites are well vegetated with aquatic plants. BMWP scores and ASPTs deteriorate with distance downstream on both the Cowley and Paddington arms. There is some evidence to suggest this deterioration is related to water quality, with several large discharges implicated in a baseline survey. However, further work is necessary to rule out the possible influence of the increasingly limited habitat provision with distance along these arms. Use of an alternative biological technique such as CHEAT (Chironomid Exuviae Assessment Technique) is also recommended, since the standard sampling method and BMWP score system is not ideally suited for biological assessments of deep waters.

### ***Bacteriological Status***












Faecal coliform bacteria are used as the indicators of faecal pollution in all types of waters. The presence of such bacteria indicates the potential presence of pathogens (agents that causes disease). Faecal contamination may arise from point sources such as sewage treatment works or diffuse sources such as agricultural land, urban run-off or misconnections of sewage into surface water drains. Bacteria can survive in water for varying lengths of time but do not multiply.



# WATER QUALITY : BACTERIOLOGICAL STATUS



## KEY

	Catchment Plan Boundary	Faecal Coliforms/100ml (Geometric Mean) (1994 and 1995 surveys)				
	Main River		Low (<1000)		Roads	
	Non Main River		Moderate (1000 - 10,000)			
	Grand Union Canal		High (10,000 - 100,000)			Scale (approx) 
	Urban Area		Very High (>100,000)			



The NRA sampled the Brent and its tributaries quarterly in 1994. The Crane catchment was also sampled quarterly in 1994, with a more extensive survey being carried out quarterly in 1995. The geometric mean of these "snapshot" samples are shown on the map previous. The figures are given in Appendix III.

The geometric mean levels of faecal coliforms in the Brent catchment watercourses were in general, high to very high (10,000 -> 100,000 cells/100ml). This is regarded as gross faecal contamination. On occasion, two sites on the Mutton Brook showed extremely high levels of faecal coliforms, in excess of 1,000,000 cells/100ml, whilst other tributaries of the River Brent often exceeded 250,000 cells/100ml. The upper reaches of the Wealdstone Brook also have very high mean values and these two tributaries warrant further investigation to trace the source of the faecal contamination. See Issue 4.2 - Sewage page 94.

In comparison, the levels of faecal coliforms in the Crane catchment, are overall lower, giving a geometric mean range of low to moderate (<1,000 - 10,000 cells/100ml). This is regarded as baseline levels rising to the equivalent of a watercourse carrying a well treated sewage effluent.

Monitoring undertaken by the NRA has identified areas where there are elevated levels of faecal coliforms in watercourses which contribute to the bacterial loading of the River Brent. The most likely causes of this faecal contamination are misconnections of foul water and sewage into surface water drains, leaking sewers and overflows from combined sewers. The Local Authority Environmental Health Officers are responsible for advising the public on the health implications of this data.

### **Pollution Incidents**

The pattern of pollution incidents occurring within the Brent and Crane reflect the urbanised nature of the catchment. The catchment is dominated by large residential and industrial developments, and is, served by major trunk roads. It is therefore not surprising that oil pollution accounts for the majority of incidents reported to the NRA. Pressures on the sewerage system, caused by high population densities, are exacerbated by the age of the sewers in parts of the catchment.

Tracing pollution incidents is more difficult than in rural parts of the region, because many of the tributaries have been culverted for the vast majority of their length. Incidents can only be traced by lifting manholes along the culverts, which is both difficult and time consuming.

A total of 558 incidents were reported to the NRA during the period 1992 to 1994 (see Table 10). All incidents are investigated and categorised according to the NRA's policy on "Enforcement and prosecution with respect to pollution incidents affecting controlled waters" (see Appendix III).

The most significant causes of pollution in the catchments are:

#### **Oil**

The presence of oil is often reported after rainfall, when small quantities of oil from a variety of sources is washed into the surface water sewers and rivers. Throughout the majority of the catchment, surface water from roads and roofs is separated from effluent from toilets, sinks and other domestic appliances. The surface water is piped to rivers and the effluent runs via foul sewers to be treated at sewage treatment works. For this reason,

waste oil should never be poured down road gullies. Oil pollution can also result from vandalism and corrosion of oil tanks or pipelines and accidental spillages. **See Issue 4.2 - Oil page 97.**

### Sewage

Short term sewage pollution usually occurs as a result of blockages in the sewer or a failure of part of the sewerage system. Long term pollution is more difficult to trace as events are numerous and intermittent in nature. Misconnections are the most common cause of pollution. These occur when domestic appliances, such as washing machines, are wrongly connected to the surface water sewer. This type of pollution can also occur when the foul sewerage system is overloaded at times of peak demand. **See Issue 4.2 - Sewage page 94.**

### Urban Run-off

During heavy rainfall, oil, dirt, organic and other polluting matter may be washed from roads and pavements into the rivers making them silty, oily and depleting the dissolved oxygen level. This is a particular problem in summer because higher temperatures reduce the water's ability to carry dissolved oxygen, further increasing the stress on fish and other aquatic life. **See Issue 4.2 - Urban Run-off page 93.**

### Natural

Algal blooms are the cause of most natural pollution incidents affecting the watercourses. The blooms cause the water to appear discoloured, and may form surface scums which resemble oil or paint pollution. **See Issue 4.2 - Algae page 95.**

**TABLE 10 : POLLUTION INCIDENTS IN THE BRENT AND CRANE**

Incident Type	Incident Severity (see Appendix III for definitions)			Total Reported
	Major	Significant	Minor	
Oil	1	25	212	238
Chemical	0	5	69	74
Sewage	0	22	96	118
Natural	0	1	17	18
Agricultural	0	0	0	0
General	0	9	59	68
Urban Run-off	0	2	19	21
Not known	0	0	21	21
<b>TOTAL REPORTED</b>	<b>1</b>	<b>64</b>	<b>493</b>	<b>558</b>

Incidents reported to the NRA during the period 1/1/92 to 31/12/94



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### Groundwater

The London Clay acts as an impermeable barrier to groundwater movement and protects the underlying Chalk from potentially polluting surface activities. The Chalk is a major aquifer and is the most important groundwater resource within Thames Region. It supports many high quality groundwater abstractions, including large public water supply abstractions.

Within the Brent and Crane catchments there are twenty two groundwater abstractions. Due to the London Clay, the vulnerability of the chalk aquifer within the catchment is low. However, pollution of the chalk aquifer may occur by direct discharges of contaminants to groundwater, via boreholes or by the creation of a pathway for the migration of contamination from surface levels (eg. during deep piling construction works). For example this may occur during deep piling works and where the overlying strata is removed, as in mineral workings. Infilling of a former quarry at Ickenham with waste appears to have caused contamination to chalk groundwater and may present a risk to a public supply borehole. This is currently under investigation by the water companies and the NRA.

The limited outcrops of alluvium deposits and flood plain gravels that exist along the length of the Brent, form a "perched" groundwater table, which is classified as a minor aquifer. The water table within the gravels is normally high and has a corresponding susceptibility to pollution. Protection of this perched groundwater is important, as the aquifer exhibits a degree of hydraulic continuity with surface watercourses.

The flood plain gravel deposits become more extensive towards the south of the catchment, where they form part of the major aquifer of Middle Thames Gravels. Extensive mineral extraction and associated landfilling of wastes has occurred in this area over many years. The high water table within the gravel aquifer is highly susceptible to pollution from landfilling with potentially polluting wastes. In some areas, groundwater pollution has been identified and the river corridors of some watercourses, such as the Yeading Brook, are subject to ingress of polluted groundwater and leachate from former landfill sites.

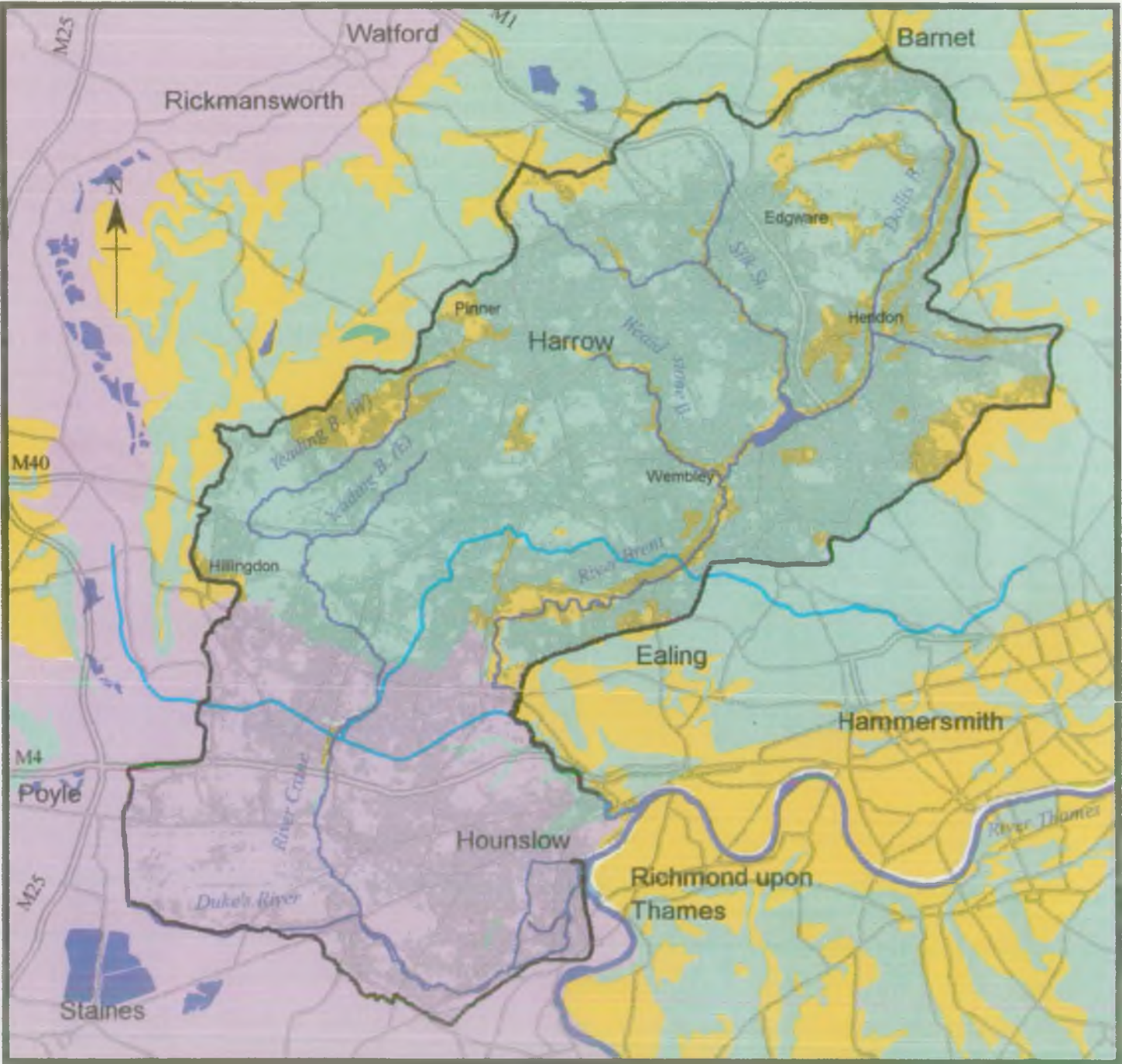
The Brent and Crane catchments are highly populated and have a long history of industrial development. Until recently many of the industries employed limited control in the handling of potentially polluting substances. In many parts of the catchment large areas of ground have become contaminated and, at some locations, has resulted in contamination of surface water drains which discharge to surface watercourses. Groundwater has also been subjected to polluting inputs over a long period of time and it is evident that contamination of the gravel aquifer has occurred.

The types of activity which may have led to contamination in the Brent and Crane catchments include:

- uncontrolled tipping of waste into former gravel pits
- manufacture of town gas
- metal plating industry
- fuel storage.



GROUNDWATER PROTECTION



KEY

	Catchment Plan Boundary	Groundwater Vulnerability Classification			
	Main River		Major Aquifer		
	Grand Union Canal		Minor Aquifer		
	Urban Area		Non Aquifer		
	Roads		Inland Water Body		

Scale (approx)  
0 5 km



The degree and extent of contamination within the catchment has not been fully defined, since knowledge is site specific and is principally derived from sites which have undergone redevelopment.

Some problems of groundwater quality have been addressed, usually during the redevelopment of sites with varying degrees of success. Examples include work at Heathrow Airport central fuel terminal and certain metal plating works. However, in areas where historical industrial development is known to have caused widespread groundwater contamination, the benefits and feasibility of any groundwater clean up must be carefully considered.

When dealing with contaminated ground and groundwater, the policies described in the NRA's "Policy and Practice for the Protection of Groundwater" will be applied. For the Brent and Crane catchments this will require consideration of the following factors.

Protection of "sensitive receptors", which include:

- abstractions from boreholes and wells
- watercourses which may be subject to ingress of polluted groundwater
- sites where polluted groundwater in the perched gravel aquifer could enter the underlying chalk.

This will be achieved by:

- removal of the source of continuing or potential pollution
- removal of any secondary source of pollution, such as contaminated land which may lead to further pollution of water
- consideration of the merits of groundwater clean up on the basis of sensitive receptors.

Unilateral action by the NRA to clean up groundwater is not considered appropriate at present and would not offer the best value for money in addressing groundwater protection in Thames Region. The most likely sensitive receptors in the Brent and Crane catchments are watercourses. However, many watercourses within the catchment 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 upon water quality due to the ingress of contaminated groundwater. See Issue 4.2 - Contaminated Land page 96.

### Introduction

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.

### *Catchment Perspective*

The principal water supply undertakings in the catchments are Three Valleys Water Services Plc (TVWS), Thames Water Utilities Ltd (TWUL) and North Surrey Water Company (NSWC). Supplies are derived mainly from existing abstractions from the River Thames, the Thames Reservoirs and the Groundwater source at Clay Lane, which are all outside the catchments.

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 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 (eg. 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 purpose 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 licenses and changes to existing licenses. 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 licences, particularly for consumptive uses, will include a prescribed flow condition limiting abstraction below defined river flows in order to protect the water environment.

### *Water Resources Development*

Future water resources need to be considered in the context of London as a whole given the conjunctive management of resources. 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 pressure 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. Controlling leakage and encouraging more efficient use of water at work and at home can significantly affect the growth in demand for water reducing the need for major new strategic water resource schemes.



Current and planned investments aimed at improving water supply reliability from existing resources within the Three Valleys supplied area mean that no long term deficits (or new water resources requirements) are anticipated within the planning horizon to 2021. The TWUL supplied area, mainly that part of the catchment to the east of the River Brent, must be considered in the context of the TWUL London supply area as a whole given the conjunctive management of resources and supply. Potential new water resources may be required for this area towards the end of the current planning horizon (2016-2021) unless the growth in demand for water can be managed further in the intervening period.

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, these 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.

### Geomorphology

Rivers naturally change their course and flow over time, but with human interference, (eg. channel straightening and weirs) the flow regime is altered which leads to different erosion and sedimentation patterns. The study of these changes is known as geomorphology.

Problems of bank erosion and siltation are found within these catchments. Geomorphological studies have been carried out in the past by the NRA's Environmental Assessment department and of note is a proposed Geomorphological Audit of the catchments to be undertaken by March 1996. This will focus on key reaches of the water courses, and evaluate the causes of, and solution to, erosion and deposition issues.

### Landscape

Some sections of the catchments were the subject of Landscape Assessments in 1993, focusing mainly on the Silk Stream catchment and including the Edgware Brook and the Edgwarebury Brook. The assessment evaluated the characteristics of the rivers' landscape and prescribed appropriate management strategies for the different lengths of channel (see description of classes and management approaches below). The channels at the very top of the catchment were identified as class 1 requiring a conservation management approach, whereas the rest of the channels in the Silk Stream catchment were a mixture of classes 2, 3 and 4 requiring either restoration or enhancement.

It is envisaged that landscape assessments for the entire catchment will be completed in the near future. The Catchment Management Planning process helps to identify areas of need and target resources (when these become available). At present, the exact timetable for assessments within the Brent and Crane catchments has yet to be agreed. See Issue 4.3 - Man Made Materials p.98.

The surveys which are undertaken, 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 the appropriate management approach -

- **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.

### Land Use Planning

Government policy on land use planning highlights the importance of good communications between the NRA and the 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.



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 aquatic conditions are just some of the considerations that have to be weighed up during the process of making decisions on development.

The NRA's role in this process is as a statutory consultee. We take this role very seriously and seek to influence policy making at national, regional and local levels so that decisions made by local planning authorities take into account all the relevant issues.

Within the Brent and Crane catchments the NRA is particularly keen to ensure that:

- existing open rivers are retained by avoiding culverting
- culverted sections of river are re-opened where opportunities arise
- where 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
- development which could increase flood risk is avoided

See Issues - 4.3 Culverting page 99, 4.2 Contaminated Land page 96 and 4.9 Flooding page 111.

We have been working with all the relevant local planning authorities 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" (January 1994) covers the following issues:

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

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

• Harrow	59%	• Hillingdon	75%
• Barnet	85%	• Brent	82%
• Camden	70%	• Hounslow	79%
• Ealing	78%	• Haringey	90%
• Richmond Upon Thames	80%		

These figures can be slightly misleading but show clearly that the Local Authorities within the catchments have a good reflection of water issues within their development plans.

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 Action Plan for the Brent and Crane will contain a "Land Use Statement" which will draw to the fore key land use planning issues needed to be covered in development plans.

### **Flood Defence**

**Flood Alleviation:** "Standards of Service for Urban and Rural Flood Defence" is a system prepared by us to assess appropriate standards of service and to plan for providing a consistent approach towards service provision. A key feature of the system is that it relates flood defence standards of service to current land use in the floodplain. As land use varies so therefore do customer interests and the requirements for flood defence and land drainage. Different land uses have been brought together into five land use bands from A (heavily urbanised) to E (unintensive agriculture). Each land use band has a "target range" of service levels.

**Floodplain and River Control:** It is preferable to prevent flooding problems arising rather than to solve them later. The relevant authority for controlling development in the floodplain is not, however, the NRA, but the local planning authority. We have recently adopted a Non-Tidal Floodplain Policy and are working with the local planning authorities to insure its implementation. The purpose of this policy is to protect the catchment's flood storage areas and routes, as defined by the 1 in 100 year flood event, from new development.

This approach is detailed further in Department of the Environment Circular 30/92 which encourages local planning authorities and the NRA to liaise closely on flooding and surface water run-off matters. The aim is to ensure that the flood defence risks of development and an integral part of the decision making process undertaken by local planning authorities on relevant planning applications. In this respect, the NRA has a responsibility to prepare Section 105 surveys to define the nature and extent of flood risk. The preparation of such surveys is the subject of a recent Memorandum of Understanding between the representatives of the local planning authorities and the NRA. See Issue 4.9 - Management of Flood Risk page 110 to 113.



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

The remainder of this section is about the future of the Brent and Crane catchments. It focuses primarily on the issues that have been brought to our attention via the extensive liaison process undertaken (see Appendix II).

Each of the issues is presented within a similar format. Following the presentation of background information, we describe the available options, their pros and cons and then identify key partners likely to be involved in undertaking those potential actions. These have all been presented within a tabular format.

**We realise that further knowledge and ideas exist 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:**

- are there other issues, not yet covered?
- are there other options we have not considered?
- are there more pros and cons?
- are our maps and 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 right to co-ordinate actions for the water environment?

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 Action Plan which is programmed for completion in **June 1996**.

We will try and accommodate all the comments we receive. However, we must all realise the constraints on action that exist. These come about because of the varying powers and objectives of organisations, land ownership and availability, our level of scientific knowledge, timescales and inevitably, the available level of resources. It is unlikely that funds will be made available to implement all of the ideas for improvements suggested in this section and the others that will come forward as a result of consultation.



However, the consultation process does offer the opportunity to us to prioritise action and to ensure the best use of resources. Even if no action is possible in the short term, any idea raised will now be recognised and as a result will be prioritised for longer term investigation or implementation when circumstances and priorities may be different. It must also be realised that although this document has been prepared by the NRA, it is not solely within the NRA's power to carry out all the potential actions listed. There are many options where the NRA could only have a supporting role and some that are clearly outside the NRA's remit.

This is a plan for the water environment of the Brent and Crane catchment. It should not be restricted by the capacity of individual organisations and groups to achieve action as we recognise there are many opportunities for closer partnerships to combat the diverse and complex issues of this area. **As part of the process of identifying catchment issues we have also undertaken a Strategic Environmental Assessment (SEA) of the potential options, a copy of which is available on request.** The SEA evaluated draft options for action against sustainability principles set out in the NRA document "Thames 21". This was undertaken to ensure that the options for action did not conflict with the NRA's more strategic environmental objectives.

The following table highlights the key issues that have been identified for the Brent and Crane Catchment Management Plan and these are discussed in greater detail in the following section:

TABLE 11 : CATCHMENT ISSUES - WHICH RIVERS DO THEY AFFECT?

Issues	Duke's	Crane	Yeading (E)	Yeading (W)	GUC	Brent	Wealdstone Brook	Silk Stream	Edgware Brook	Deans Brook	Mutton Brook	Dollis Brook	Brent Reservoir
<b>4.2 Water Quality</b>													
Run-off	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Sewage		✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓
Algae					✓		✓						✓
Contaminated Land		✓	✓	✓	✓								
Oil	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
<b>4.3 Channels and Flows</b>													
Man Made Materials	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	
Culverting			✓	✓		✓	✓		✓	✓	✓		
Invasive Plant Species	✓	✓				✓		✓					
River Flows	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
<b>4.4 Land Use</b>													
Terminal 5	✓	✓											
Funding		✓			✓	✓							
Drainage Policy	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
<b>4.5 Amenity and Recreation</b>													
Improvement		✓	✓	✓		✓	✓	✓	✓	✓			
<b>4.6 Litter</b>													
Litter		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓
<b>4.7 Information and Communication</b>													
Awareness	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Signage	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
<b>4.8 The Brent Reservoir</b>													
Future Management													✓
<b>4.9 Management of Flood Risk</b>													
Revision	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Flooding	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
New Works	✓	✓	✓	✓		✓	✓	✓	✓	✓			
Maintenance	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
<b>4.10 Fish Management</b>													
Fish Management	✓	✓	✓	✓		✓		✓	✓	✓		✓	✓



The quality of water within the catchments is variable, with the Brent exhibiting a poorer standard than that of the Crane and its tributaries. A principal aim of the NRA Water Quality Strategy 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.

In attempting to overcome some of the main water quality issues, this section will examine:

- *Urban Run-off*
- *Algae in Canals, Rivers and Reservoirs*
- *Oil*
- *Sewage*
- *Contaminated Land - Potential to Pollute Ground and Surface Water*

Tackling the root causes of water quality is going to be a long and costly job. To this end, it is important that the co-operation of all bodies is aimed for, to maximise the benefits for the water environment.

BRENT AND CRANE CMP KEY ISSUES	
ISSUE NO:	Water Quality - 1
ISSUE:	Urban Run-off
<b>BACKGROUND INFORMATION:</b>  After periods of little rainfall large amounts of litter, leaves, oil and grit from roads and other paved surfaces accumulate in the drainage systems through the catchments. It only requires a small amount of rainfall to dislodge this rubbish and to wash the material into the surrounding watercourses. This flush of polluting material can have a severe effect on the quality of the rivers and streams. Within the catchments there is a large extent of hard surface areas and this simply adds to the problem. Urban run-off is considered to be a catchment wide issue.	
<b>OPTIONS:</b> 1. Change the consultation criteria for the planning liaison function of the NRA, so that all developments which may have a pollution impact may be monitored and managed. 2. Where possible, encourage the use of buffer zones and reed beds to protect the river system. 3. Education and pollution prevention discussions could be targeted throughout the catchments. 4. Continue investigation into suitable methods for treating urban run-off.	
<b>PROS &amp; CONS:</b>  Pollution prevention, education and other methods can help to reduce this problem to a degree. However due to nature of the catchment, the impacts of urban run-off will be extremely difficult to reduce.	
<b>PARTNERS:</b> NRA, Local authorities, TWUL, Industry, Developers	

### BRENT AND CRANE CMP KEY ISSUES

**ISSUE NO:** Water Quality - 2

**ISSUE:** Sewage

**BACKGROUND INFORMATION:**

Problems are experienced in the catchment from sewage flowing directly into the river network. This problem is due to a number of causes which are discussed specifically in Section 2.11. Within main rivers the problem is diluted by larger flows of water, but in the smaller tributary streams, including Mutton, Wealdstone, Kenton, and Dollis Brooks, the consequences can become very unpleasant. However, the diffuse nature of the problem means that tracing the problem properly is time consuming and expensive.

**OPTIONS:**

1. Investigations are required for each polluted discharge to consider if the problem is individual misconnections on a large scale, or defects in the sewerage network.
2. The use of mailshots and public relations could be undertaken, to try and explain the problem to the public.
3. Inform all the local authorities within the catchment of the issues.
4. Employ a systematic approach in tackling the problem.
5. Prioritise activities on rectifying those areas which are exhibiting the worse problem ie. Wealdstone Brook, Mutton Brook.
6. Ensure that the local planning authorities are supplying the correct advice with regards to connections and development.
7. Promote the "Bag it and Bin it" initiative being undertaken by water companies and the NRA.

**PROS & CONS:**

The only way to overcome the problem of sewage entering the surface water system, is to investigate every potential cause within the catchment. This is impossible in terms of time, resources and physical accessibility. No single agency has the power or funds to deal with pollution on this scale. Effective action will need the co-operation of all bodies and additional resources above and beyond those currently available.

Considerable research needs to be completed to determine the most effective means of tackling the problem.

**PARTNERS:** NRA, TWUL, Local Authorities (drainage, highways, environmental health, building control and planning departments), general public.



### BRENT AND CRANE CMP KEY ISSUES

**ISSUE NO:** Water Quality - 3

**ISSUE:** Algae in Canals, Rivers and Reservoirs

#### BACKGROUND INFORMATION:

All rivers contain nutrients which support flora and fauna. However, large excesses may cause significant increases in algal and/or 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. Algae growth has also been an issue on the Brent Reservoir in recent years, with specific problems being encountered during the summer of 1995, and on the Wealdstone Brook.

The process of stimulating excessive aquatic plant growth is known as eutrophication and there has been evidence of this occurring within the catchment, primarily caused by untreated sewage entering the river system. Algal Blooms can also occur in low flow situations when the watercourse is not eutrophic.

#### OPTIONS:

1. Ensure by better design that the flow of water in rivers is kept moving, to flush the channel regularly.
2. Initiate monitoring of the nutrient levels within the catchment, to highlight algal hot spots.
3. Determine whether eutrophication is a problem here and establish why it is occurring.
4. Increase public awareness over the problems of Algae growth.

#### PROS & CONS:

It is virtually impossible to remove all of the algae and weed within a watercourse, and in fact this would be detrimental in terms of their ecology. Problems start to occur when the growth of these entities becomes excessive and their presence, as a result, is detrimental to the water environment. It is when this situation occurs that action should be taken. Increasing the flows within rivers could also provide problems, with specific works unlikely to be undertaken by the NRA.

**PARTNERS:** NRA, UK Government, Local Authorities, BW

### BRENT AND CRANE CMP KEY ISSUES

**ISSUE NO:** Water Quality - 4

**ISSUE:** Contaminated Land - Potential to Pollute Ground and Surface Water

#### BACKGROUND INFORMATION:

Due to the industrial history of the catchments, there are a number of contaminated land sites. Industry has exercised little control in handling potentially polluting substances, at least until recent decades. In some areas, large tracts of ground have become contaminated. Some problems of contamination have been addressed with varying degrees of success, particularly where this has been necessary during the redevelopment of sites.

As highlighted by Section 3.1, the lower part of the catchments are designated as a major aquifer, due to the glacial outwash gravels that are located here. Consequently the threat of disturbing contaminated land is a serious one which could affect the catchment in the future. There are sites known to be contaminated near the River Crane, Yeading Brook and the Grand Union Canal.

#### OPTIONS:

1. The NRA and the Planning Authorities working together to ensure appropriate clean up measures as part of any planning permission for contaminated sites.
2. Encouraging pollution prevention initiatives by industry, including the cleaning up of groundwater, where appropriate.
3. Encourage Local Authorities to use the NRA's *"Policy and Practice for the Protection of Groundwater"* when dealing with contaminated sites.

#### PROS & CONS:

Contaminated land is not on the scale of some of the other catchments within the Thames Region, although where it does occur it may have implications for ground and surface water quality. Opportunities for cleaning up contaminated land will primarily appear through the planning process and through the use of 106 Agreements. Direct action by the NRA on cleaning sites is highly unlikely.

**PARTNERS:** Local Authorities, NRA, Industry and Developers.



### BRENT AND CRANE CMP KEY ISSUES

**ISSUE NO:** Water Quality - 5

**ISSUE:** Oil

#### BACKGROUND INFORMATION:

The extensive use of oil for lubrication, heating, cooling and cooking etc. means there is always the potential for oil to find its way into the water environment. These catchments are no exception to this rule with oil pollution accounting for 43% of all the pollution incidents reported in the past two years. A vivid reminder of the impact that oil has as a pollutant is that it only takes a few litres of engine oil to cover the surface of many acres of water. Oil is considered to be a catchment wide issue.

#### OPTIONS:

1. Increase promotion of the "Oil Care Campaign" within the catchments.
2. Identify problem areas where oil pollution incidents are frequent and undertake pollution prevention visits.
3. Initiate discussions with local authorities over the frequency of cleaning road gullies.
4. Through the planning process ensure that oil interceptors are a requirement on all new development.
5. Discuss with local authorities ways to encourage the recycling of waste oil.
6. Promote the NRAs pollution prevention guidance notes particularly those relating to the construction and operation of fuelling stations (PPG7), general pollution prevention guidance (PPG1), oil storage above ground (PPG2) and the safe storage and disposal of used oils (PPG8).

#### PROS & CONS:

None of the above solutions will solve the problem of oil pollution overnight. However raising the profile of the problem and encouraging the introduction of facilities for the recycling of waste oil may start to deal with the problem.

**PARTNERS:** NRA, Local Authorities, Industry, Voluntary Groups

Within the catchment, problems concerning the channel and the flow which it contains, are quite prevalent, due to the urban nature of the locality. Problems manifest themselves in the form of:

- *Man Made Materials*
- *River Flows*
- *Culverting*
- *Invasive Plant Species*

These problems occur to varying degrees, however many, such as culverting and the use of man made materials, are extremely difficult to rectify, as they encounter questions such as ownership responsibility, financial resources and the appropriateness of their removal. To this end, this section attempts to suggest viable options for which a long term vision is required.

<b>BRENT AND CRANE CMP KEY ISSUES</b>	
<b>ISSUE NO:</b>	Channels and Flows - 1
<b>ISSUE:</b>	Man Made Materials
<b>BACKGROUND INFORMATION:</b>  <p>Materials that have been used in the past for works upon the banks and bed of rivers have often been out of keeping with the natural character of the river. These materials have been primarily used because of their strength, durability and cost effectiveness. Whilst man made materials may be required in some circumstances to deal with specific problems more emphasis is being placed on a more environmental and aesthetically pleasing approach to future river design.</p>	
<b>OPTIONS:</b>  <ol style="list-style-type: none"> <li>1. Changing public perception, ie. that man made channels are not always synonymous with poor quality watercourses.</li> <li>2. Undertake enhancement schemes to man made channels <i>when opportunities arise</i>.</li> <li>3. Undertake a systematic landscape assessment of all main rivers and identify priority areas for enhancement.</li> <li>4. Work with developers through the planning process to ensure all future works enhance and protect the natural river corridor.</li> <li>5. Initiate a study to look at the extent of toe boarding within the catchment and identify areas where this can be removed.</li> </ol>	
<b>PROS &amp; CONS:</b>  <p>The problems of man made materials have been recognised, and its removal and replacement, is considered where appropriate. However, their complete elimination is financially unviable. It should also be noted, that even if a satisfactory enhancement scheme is put forward, its implementation may not be possible due to encroachment onto public property. Enhancement may also be hindered by a lack of space within which to incorporate a river bank of a lesser gradient.</p>	
<b>PARTNERS:</b> NRA, Local Authorities, Developers	



### BRENT AND CRANE CMP KEY ISSUES

**ISSUE NO:** Channels and Flows - 2

**ISSUE:** Culverting

#### BACKGROUND INFORMATION:

Due to its densely populated nature, the Brent and Crane catchments exhibit a high proportion of culverted watercourses. Culverting is where the river is completely sealed underground by development encroaching over the top. The impact of culverting is dramatic. A once healthy river corridor is transformed into a sterile environment where very little can survive. In addition to this culverts can also cause problems by blocking in times of flood and make tracing pollution incidents extremely difficult. The map of ordinary watercourses in Section 2 (page 21) identifies those that are culverted.

#### OPTIONS:

1. The production of a clear strategy, with regards to the NRAs position on culverting.
2. Encourage the opening up of culverted watercourses when opportunities arise via the planning system.
3. Increase the local planning authorities awareness of all the water courses (ordinary and main) within the catchment to encourage consultation with the NRA.
4. New culverting will not normally be permitted and there should be no net loss of natural watercourses.

#### PROS & CONS:

At present there appears to be no clear policy with regards to culverting, this situation is leading to confusion. However, it appears that informally, NRA guidance tends towards the opening up of culverted watercourses where possible. For this to occur there needs to be an increased awareness, of the location of watercourses within the catchment and increased consultation when development involves culverting. Unfortunately, this sort of action will increase peoples workload.

**PARTNERS:** NRA and Local Authorities.

### BRENT AND CRANE CMP KEY ISSUES

**ISSUE NO:** Channels and Flows - 3

**ISSUE:** Invasive Plant Species

**BACKGROUND INFORMATION:**

A number of non-native plant species have been introduced into the catchment, including giant hogweed (*Heracleum Mantegazzianum*) Japanese knotweed (*Polygonum Cuspidatum*) and Himalayan balsam (*Impatiens Glandulifera*). Most of these species were introduced into this country during the nineteenth century and have become quite common throughout the British Isles.

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 mammals are suited to utilising them as habitat or as food. These species colonise many different habitats, especially river banks. Due to their invasive nature, other species no longer remain present. When these species die back in the autumn, the reduced presence of any protective vegetation can leave banks prone to erosion. These species are known to be present along the River Brent, Duke of Northumberland's River, the River Crane and the Silk Stream.

The giant hogweed can additionally 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 blistering and burning. The Wildlife and Countryside Act 1981 makes it an offence to plant, or cause to grow, Japanese knotweed and giant hogweed in the wild. Himalayan balsam is not currently included in this legislation. An NRA research and development project has resulted in the production of a booklet entitled "Guidance for the Control of Invasive Plants near Watercourses". This identifies suitable methods for dealing with invasive species.

**OPTIONS:**

1. A comprehensive survey is required to confirm affected areas across the catchments, followed by a feasibility study of the techniques and costs that will be necessary.
2. Agreement of all the various parties involved regarding implementation will be essential.
3. Implementation of a systematic eradication programme potentially involving riparian landowners, local authorities, the NRA, and amenity and conservation groups.

**PROS & CONS:**

Any eradication programme will require careful costing, planning and execution. Seed dispersal and spread of the invasion primarily in a downstream direction. Such plant growth obviously respects no boundaries and complete co-operation amongst affected landowners would be essential if regeneration of the problem is to be avoided. The complete eradication may prove to be not only expensive, but impossible.

The major issue for the NRA is currently that of what level of involvement it can have in any such initiative, and how this could be funded. At the time of publication of this document this has yet to be resolved.

**PARTNERS:** NRA, Riparian landowners and Local Authorities

### BRENT AND CRANE CMP KEY ISSUES

**ISSUE NO:** Channels and Flows - 4

**ISSUE:** River Flows

**BACKGROUND INFORMATION:**

The issue of water levels is of concern in a number of locations within the catchments. Firstly, some areas of valuable habitat are dependent upon maintaining certain water levels. These include sites designated as SSSIs (ie. Brent Reservoir), for which the NRA has agreed to produce Water Level Management Plans (WLMPs) in conjunction with English Nature (EN). The plans will assess water needs, resources and future management of water related SSSIs, to protect their ecological value.

Secondly, water levels and flows need to be maintained within rivers to maintain suitable habitats for fish populations and other flora and fauna. Erratic 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.

**OPTIONS:**

1. Research needs to be undertaken into the possibility of using more porous materials for hard surfaces (ie. drive ways, car parks) to increase permeability and return more water to the rivers.
2. Support the development of a Water Level Management Plan (WLMP) for the Brent Reservoir.
3. Initiate investigations into the methods of returning a more natural flow regime to the catchments.
4. Encourage new schemes to develop low flow channels as part of any proposed designs.

**PROS & CONS:**

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

**PARTNERS:** NRA, BW, EN, WHCC, Local Authorities



The Brent and Crane catchments are populated by over 1 million people and as a result the pressure placed upon land and how it is used is immense. Land, however small, is under intense pressure for release and often the land designated for future development is located near to the river environment. The Crane catchment contains perhaps the largest strategic development within the country at the moment, with the proposed redevelopment of Heathrow Airport.

<b>BRENT AND CRANE CMP KEY ISSUES</b>	
<b>ISSUE NO:</b>	Land Use - 1
<b>ISSUE:</b>	Heathrow Airport - Terminal 5
<p><b>BACKGROUND INFORMATION:</b></p> <p>In May 1995, the public inquiry for the proposed construction of a new terminal at Heathrow Airport began. The inquiry, which is likely to be the largest ever seen in this country, will discuss the impacts of the proposals upon the environment. The purpose of the Terminal 5 proposals is to increase the throughput of passengers from the current ceiling of about 50 million passengers per annum (MPPA) up to 80 MPPA by the year 2013. Pressure will therefore be placed on the existing infrastructure to accommodate the increased traffic.</p> <p>Apart from the potential threats that the proposals present to the quality of both ground and surface water, the new terminal will be located directly on top of the Duke of Northumberland's River (DON), which flows on the western edge of the Crane catchment. As well as objecting to the culverting issue, the NRA have also raised the issue of the proposals wider impact on the Colne Valley and questioned whether the proposals are truly a sustainable option.</p> <p>At present, negotiations over a suitable mitigation package are taking place with the British Airports Authority over the future of the DON, which is perhaps the healthiest river within the catchments. Options which have been suggested include diverting the river into a new channel, which would be situated to the west of the A3044.</p>	
<p><b>OPTIONS:</b></p> <ol style="list-style-type: none"> <li>1. Divert the river channel to the west of the airport.</li> <li>2. Accept the culverting option and look elsewhere for mitigation.</li> </ol>	
<p><b>PROS &amp; CONS:</b></p> <p>If no action is taken, the catchment will lose part of the healthiest river within the catchment. However, diverting the river around the airport may not be a popular alternative with other interest groups, although alternative schemes are being discussed with local interest groups.</p>	
<p><b>PARTNERS:</b> LB Hillingdon, NRA, BAA, Colne Valley Regional Park</p>	

### BRENT AND CRANE CMP KEY ISSUES

**ISSUE NO:** Land Use - 2

**ISSUE:** Government and European Funding

**BACKGROUND INFORMATION:**

Within both of the catchments, there are a large number of projects which may qualify for funding from both European and Central Government. Predominantly Single Regeneration Budget (SRB) finance has been targeted at a number of areas within the catchment, (*Wembley, Park Royal and Brentford*) where regeneration is needed both economically and environmentally. Millennium funding, from lottery money, may also be targeted between Hampton and Kew, which effects the tidal reaches of the Brent and Crane. Wembley Stadium has been short-listed as a potential site for a new National Stadium, this would be partly funded from lottery money.

Due to the urbanised nature of the catchments, there is a high potential for enhancements to the water environment. Issues to be resolved include whether projects should be driven principally by the need to bring about environmental improvements, how to use environmental opportunities in schemes with wider scope, and suitable partners for managing a scheme.

**OPTIONS:**

1. Identify potential projects that could receive grant assistance.
2. Enter into negotiations with potential partners in the catchments.

**PROS & CONS:**

There may be potential to attract substantial additional funding into the catchment by identifying appropriate projects and partners, and nominating them for consideration.

**PARTNERS:** Local Authorities, LEU, LWT, NRA, BW, Voluntary Groups, WLWW, TWUL

### BRENT AND CRANE CMP KEY ISSUES

**ISSUE NO:** Land Use - 3

**ISSUE:** Drainage Policy

**BACKGROUND INFORMATION:**

The NRA have adopted a surface water run-off policy for both catchments because of their densely populated nature. Consequently, any development taking place at the top end of the catchment will be asked to store water and those nearer the River Thames will be asked to dispose of surface water, as quickly as possible.

Although the NRA have been promoting this policy for a number of years, it has become clear that local authorities are concerned over the apparent lack of a clear drainage policy for the catchments. An example of this is the contradictory policies, that both the NRA and TWUL operate, for the disposal of surface water. With the NRA operating on a catchment basis, the opportunity exists for the development of a co-ordinated drainage policy for the catchments.

**OPTIONS:**

1. Establish a forum to discuss drainage issues for the catchment.
2. Initiate discussions with TWUL to examine the different approaches currently used for surface water management.
3. Investigate alternative methods for dealing with surface water drainage in the catchment ie: source control.

**PROS & CONS:**

A co-ordinated approach to drainage within the catchments could perhaps reduce some of the pressure being placed upon the already stretched drainage system. However, the different views and objectives of various groups may hinder this process.

**PARTNERS:** Local Authorities, TWUL, NRA



The catchment provides very few opportunities for water based recreation, with water quality and the type of channel controlling what can and cannot take place. The Brent Reservoir provides for sailing, canoeing and windsurfing, but very few opportunities for fishing exist within the catchments. The Grand Union Canal is the other feature of note within the catchments which is used regularly by the public. Whilst this is controlled by British Waterways, the canal system integrates with the Brent in its lower stretches.

<b>BRENT AND CRANE CMP KEY ISSUES</b>	
<b>ISSUE NO:</b>	Amenity and Recreation - 1
<b>ISSUE:</b>	Improvement of Recreational Facilities
<b>BACKGROUND INFORMATION:</b>  <p>River corridors within the catchments provide a focus for recreational activity linking areas of green space together on the north west of London. Whilst groups such as the West London Waterway Walks project have made great steps in developing new riverside access, problems are still experienced because of the nature of the environment itself.</p> <p>Whether it is blockages on footpaths, pollution in the rivers or the lack of suitable access, rivers are a natural feature which need to be enhanced as a true recreational resource where appropriate.</p>	
<b>OPTIONS:</b>  <ol style="list-style-type: none"> <li>1. Develop closer links with groups promoting positive recreation within the catchments ie. London Walking Forum.</li> <li>2. Ensure all future NRA works take recreational issues into account at the design stage.</li> <li>3. Identify areas where the NRA could be involved with potential enhancement projects.</li> <li>4. Ensure the NRA gives its full support and advice to the Welsh Harp Consultative Committee in meeting the objectives of its management plan.</li> </ol>	
<b>PROS &amp; CONS:</b>  <p>Promoting recreational access alongside rivers can be of benefit in raising the profile of water issues in the catchments. What must be ensured is that footpaths and recreational facilities are developed with safety as their prime concern.</p>	
<b>PARTNERS:</b> WLWW, NRA, BCU, WHCC, Local Authorities, BW, Voluntary Groups, London Walking Forum	

Accumulation of litter and rubbish in rivers is a particular problem in any heavily populated catchment. Education, enforcement action, and prevention all have a role to play in tackling this problem.

<b>BRENT AND CRANE CMP KEY ISSUES</b>	
<b>ISSUE NO:</b>	Litter - 1
<b>ISSUE:</b>	Litter and Rubbish
<p><b>BACKGROUND INFORMATION:</b></p> <p>A major problem that affects the catchments is rubbish and litter being thrown or blown into the rivers. Often many areas become polluted with domestic rubbish such as oil and garden cuttings, which either block or pollute the water.</p> <p>A particular problem for the catchments is shopping trolleys being thrown into the rivers. These create blockages in the rivers and can become a real problem at times of heavy rainfall. There are particular bad spots in the Brent catchment at Edgware Hospital and Tockington, where on most days of the week shopping trolleys can be found.</p> <p>This issue has also been raised by BW, who receive a large amount of rubbish and silt from the River Brent. This rubbish ends up blocking the lock gates downstream of the confluence between the GUC and the Brent, and causes a specific problem for BW.</p> <p>It should be noted that whilst the NRA will remove debris from the river which could lead to an increased threat of flooding, it is not responsible for general litter clearance on banks. This responsibility lies solely with the riparian owner.</p>	
<p><b>OPTIONS:</b></p> <ol style="list-style-type: none"> <li>1. Initiate a litter awareness campaign and target problem areas.</li> <li>2. Discuss with supermarkets methods of reducing the number of trolleys being taken from their premises and ways of recharging for clearance.</li> <li>3. Add litter clearance in rivers to local authority maintenance contracts.</li> <li>4. Place a boom across the River Brent to stop rubbish flowing into the GUC.</li> <li>5. Increase signage at litter hotspots and design sites to minimise litter accumulation.</li> <li>6. Involve voluntary groups in clearance schemes.</li> </ol>	
<p><b>PROS &amp; CONS:</b></p> <p>Addressing this problem will reduce the time and effort spent on clearing the river of rubbish and allow more time to be spent on improving the water environment. Benefits will also be seen in reducing the amount of pollutants and obstructions found within these watercourses.</p>	
<p><b>PARTNERS:</b> Local Authorities, NRA, BW, Voluntary Groups, Supermarkets</p>	

During the informal public consultation phase of the plan, it has become apparent that a great deal of confusion still exists over the role of the NRA and its responsibilities. This has been highlighted by the wide range of signs found beside the water giving various types of information relating to water issues.

### BRENT AND CRANE CMP KEY ISSUES

**ISSUE NO:** Information and Communication - 1

**ISSUE:** Public Awareness

#### BACKGROUND INFORMATION:

After discussion with various groups in the catchments, it has become increasingly apparent, that even those bodies that work on a day to day basis with the NRA, do not necessarily understand the function of the Authority and the powers that it has.

It may be assumed therefore, that if those who should be aware of the NRA's functions are not, then it is even less likely that the general public can be expected to understand the Authority's purpose. This matter will be especially relevant when the Environment Agency is formed in April 1996 and when even more confusion is likely.

#### OPTIONS:

1. Develop a rivers awareness campaign.
2. Initiate a "First / One Stop Shop" for all water enquiries.
3. Identify key groups for education (possibly local councillors)...
2. Produce appropriate materials linked to the National Curriculum ie.: schools pack - basic catchment plan.
5. Look at the feasibility of establishing a water environment study centre within the catchments.
6. Adopt a standard approach to general enquiries.
7. Establish links with Local Agenda 21 network.

#### PROS & CONS:

The process of educating both the general public and responsible authorities, is both costly and time consuming. However, without educating these key groups, people will not be aware of the issues that face the water environment.

**PARTNERS:** Local Authorities, NRA, BW, EN, LEU, LWT, TWUL



BRENT AND CRANE CMP KEY ISSUES	
ISSUE NO:	Information and Communication - 2
ISSUE:	Signage
<p><b>BACKGROUND INFORMATION:</b></p> <p>Within the catchments can be found a wide variety of interpretative information and warning signs. Often the general public will be completely unaware of the rivers that flow around them and presenting information in an accessible and visual format can attract peoples attention.</p> <p>However the type of signs used within the catchment presents a number of issues.</p> <p>A. <i>Misinformation</i> - incorrect or alarmist information  B. <i>Continuity</i> - different designs, shapes and sizes  C. <i>Informative</i> - interesting factual information</p> <p>Many of the London Boroughs have placed warning signs adjacent to the watercourses with information such as "<i>Danger : Stream Liabale to Flood</i>" or "<i>Polluted Water</i>" being displayed. Whilst these signs may be factually correct, the question has been raised over the wide variety of designs and messages that have been used to convey information to the public. Also, whether these signs create the right impression or contain the correct information.</p> <p>The idea of increasing road signage has also been raised, to attempt to lift the profile of the rivers that flow through the catchments. As the majority of people drive to work, signs could be placed on bridge crossings to make them aware of these natural features.</p> <p>Problems have also been experienced with interpretive information being vandalised. Whilst attempts to provide information and create awareness should be continued, the methods and materials used to do this should be investigated.</p>	
<p><b>OPTIONS:</b></p> <ol style="list-style-type: none"> <li>1. Develop a co-ordinated signing policy for the catchment in co-operation with the WLWW.</li> <li>2. Establish the need for warning signs adjacent to watercourses and clarify their design and content.</li> <li>3. Identify suitable locations for interpretive information around the catchment.</li> <li>4. Investigate methods of preventing or reducing vandalism on interpretive information.</li> <li>5. Implement a road signage policy for the main rivers in the catchments.</li> </ol>	
<p><b>PROS &amp; CONS:</b></p> <p>There are potential conflicts of interest in terms of presenting information on pollution and flooding issues. Whilst clarity is needed, this will become an area of further debate. There will also be a cost involved in developing a new signage policy, but this must be weighed against the benefits of raising the profile of water related features.</p>	
<p><b>PARTNERS:</b> BW, NRA, Local Authorities, WLWW</p>	

The Brent or Welsh Harp reservoir was constructed in 1835, to act as a storage reservoir for the Grand Union Canal. The reservoir is located at the confluence of the Silk Stream and River Brent, in close proximity to the Wembley area of North London.

The reservoir is classed as a SSSI, in terms of both its flora and fauna. However, this must be balanced with the reservoir's further role as that of a recreational resource.

Legal title to the land is held by three groups: British Waterways; the London Borough of Barnet and the London Borough of Brent, with the Welsh Harp Consultative Committee acting as a co-ordinating body. The committee is comprised of the various groups who have an interest in the future of the reservoir and is made up of both statutory and public groups, of which the NRA is one. In 1992, the committee commissioned a report from Cobham Resource Consultants to develop a future management strategy for the reservoir and at present the plan has reached a consultation stage.

#### BRENT AND CRANE CMP KEY ISSUES

**ISSUE NO :** Brent Reservoir - 1

**ISSUE :** Future Management of the Reservoir

##### BACKGROUND INFORMATION :

At present the reservoir faces a number of issues that will effect the future health and use of this feature. These are:

- Algae Growth
- Reservoir Use - Recreation and Conservation
- Fish Management
- Siltation
- Water Level Management

With the publication of the Management Plan for the reservoir in September 1994, what must be ensured that any future actions of the NRA and predecessors should integrate closely with the aims of the strategy. Specific issues for the reservoir have been tackled under other headings within Section 4 ie. Water Quality - Algae.

##### OPTIONS:

1. Ensure the NRA is actively involved with the WHCC.
2. Investigate opportunities for projects relating to the reservoir where resources allow.
3. Ensure the CMP process integrates with the actions of the Management Strategy.

##### PROS & CONS:

Failure of the NRA to support the WHCC and the Boroughs will lead to confusion over the future management and development of the reservoir. What must be ensured is that the catchment plan fully integrates with the adopted management strategy for the reservoir.

**PARTNERS:** NRA, WHCC, BW, EN

The NRA has a clear aim "to provide an effective defence for people and property against flooding from rivers and the sea". Managing flood risk is therefore an area of key importance that has to be considered in the future management of the catchments. There are a number of issues therefore which will need to be addressed, these are:

- *Main River Revisions*
- *New Flood Alleviation Works*
- *Flooding*
- *Maintenance Works*

<b>BRENT AND CRANE CMP KEY ISSUES</b>	
<b>ISSUE NO :</b> Management of Flood Risk - 1	
<b>ISSUE :</b> Main River Revisions	
<p><b>BACKGROUND INFORMATION :</b></p> <p>All watercourses are classified by the Ministry of Agriculture, Fisheries and Food (MAFF) as either "main river" or "ordinary watercourse".</p> <p>Main river is covered by the Water Resources Act 1991 and is defined on maps held by the Authority. In broad terms main river includes all watercourses of strategic arterial drainage. Revisions to main river are lodged with MAFF to take into account any physical changes such as straightening and realignment. The NRA has undertaken a national review of what ought to be included as main river in order to obtain a consistent approach. The use of consistent criteria could significantly increase the length designated as main river.</p> <p>Ordinary watercourses are covered by the Land Drainage Act 1991. The relevant local authority has similar permissive powers which can be exercised over these watercourses.</p>	
<p><b>OPTIONS:</b></p> <ol style="list-style-type: none"> <li>1. NRA to carry out a review of the main river classification parameters for the watercourses within the Brent and Crane Catchments.</li> <li>2. NRA to consider any justifiable suggestions for extension/reduction of main river limits.</li> </ol>	
<p><b>PROS &amp; CONS:</b></p> <p>Increasing the length of main river would enable the NRA to exercise its permissive powers over watercourses currently outside of such jurisdiction. This may be beneficial where potential flood alleviation schemes are close to, or straddle the boundary between main river and ordinary watercourse. Pursuance of such schemes can involve a level of unnecessary duplication between the NRA and the local authority.</p> <p>NRA maintenance works could also be extended, although the major resultant issue of available funding would have to be satisfactorily addressed.</p>	
<b>PARTNERS:</b> NRA, Local Authorities and MAFF	



### BRENT AND CRANE CMP KEY ISSUES

**ISSUE NO :** Management of Flood Risk - 2

**ISSUE :** Flooding in Parts of the Catchments

#### BACKGROUND INFORMATION :

A number of schemes have been implemented in the catchment which have reduced the risk of flooding. However, it is recognised that flooding on several watercourses, especially some of the tributaries, causes damage and disruption.

Floods are categorized by their return period in terms of years. The longer the return period the greater is the flood. All flood alleviation schemes are designed to defend up to a predetermined return period. Floods of greater return period will breach the defence.

Currently within the catchments the NRA has commissioned feasibility studies to alleviate flooding on the Edgware Brook and Deans Brook.

#### OPTIONS:

1. Implement policies to prevent development from causing an increased flood risk.
2. Implement policies to encourage new developments to build in flood water storage measures.
3. To assist 1 & 2, undertake studies (Sec 105) to update existing flood plans and provide this information to Planning Authorities.
4. Continue with routine maintenance work to watercourses for the reduction of flood risk.
5. Confirm the standards of protection offered by existing flood alleviation schemes, especially in the light of changes in development and other land use. Carried out in conjunction with Section 105 surveys.
6. Carry out feasibility studies for potential flood alleviation schemes. These may be identified as a result of known flood or/and from results of the Catchment Management Plan consultation process.
7. Investigate the provision of flood warning stations on tributaries particularly in the upper reaches ie. Edgware Brook, Deans Brook.

#### PROS & CONS:

Existing levels of watercourse maintenance are subject to availability of resources. Significant numbers of additional flood alleviation schemes have now been created. Lack of an increase in overall-levels of pre-planned-maintenance would compromise the integrity of the protection provided by these existing schemes in the future. However, any increases in maintenance of structural assets may have to be balanced with the levels of routine maintenance to watercourses, for example in vegetation control.

The relative priorities of these activities may need to be re-assessed with one another if any identified-funding-for-asset-maintenance-was-not-obtainable. Some potential-alleviation-schemes may not achieve a positive benefit cost ratio and may therefore not be allowed to progress. Environmental acceptability also has to be achieved.

**PARTNERS:** NRA, Local Authorities, Developers and MAFF

### BRENT AND CRANE CMP KEY ISSUES

**ISSUE NO :** Management of Flood Risk - 3

**ISSUE :** Provision of New Flood Alleviation Works

#### BACKGROUND INFORMATION :

In addition to general watercourse maintenance work, the NRA uses its right to exercise powers to provide effective protection for people and property from flooding through the construction and maintenance of specific flood defences. Such defences are designed to deal with floods of a certain magnitude. The likelihood of a flood of a given magnitude occurring is known as a "return period". This is a statistical way of expressing the chance of a particular event happening during a time period, for example once in ten years, once in twenty years, etc. Different land uses may require protection against different levels of flood.

Local Authorities have similar powers for providing flood defences to Ordinary watercourses.

#### OPTIONS:

1. NRA to continue to investigate the feasibility of carrying out further improvement works on Main River.
2. Local Authorities to similarly continue to do so for Ordinary watercourses.
3. Riparian owners and local authorities and the NRA to continue to communicate to ensure appropriate awareness of the magnitude of local flood events.
4. NRA to confirm the standards of protection offered by existing flood alleviation schemes, particularly in the light of changes in development and other land use.

#### PROS & CONS:

It is important to note that funding for such schemes can only be invested within certain government guidelines. These include the requirement that the cost of any scheme is at least equalled by the value of any benefits to be gained. Whilst many schemes can be designed to be technically feasible, they will not all reach these cost benefit criteria and some are therefore unable to proceed.

It should be understood that all flood alleviation schemes have a finite capacity and therefore that, given a flood of sufficiently high magnitude, constructed flood defences can be overwhelmed.

**PARTNERS:** Riparian landowners, Local Authorities, MAFF, NRA

### BRENT AND CRANE CMP KEY ISSUES

**ISSUE NO :** Management of Flood Risk - 4

**ISSUE :** Maintenance Works

#### BACKGROUND INFORMATION :

Watercourses are owned by their respective riparian owners, with whom the ultimate responsibility for maintenance works.

The NRA, whilst not generally owning the watercourses, has permissive powers under the Water Resources Act 1991 to carry out maintenance works to those watercourses classified as "Main River", and where there can be benefit through a reduction of potential flood risk. Local Authorities have similar powers for "Ordinary Watercourses".

The NRA's works on watercourses consist primarily of vegetation control, clearance of obstructions to flow, and removal of significant accumulations of silt.

Maintenance is additionally carried out to the NRA's assets, where flood alleviation schemes have been created (eg. sluices, weirs, flood storage reservoirs, flood defence walls). Such maintenance will comprise inspection and maintenance to structural components such as concrete, brickwork, steelwork, mechanical and electrical machinery.

#### OPTIONS:

1. The NRA to continue to carry out maintenance work to main river watercourses for the reduction of flood risk.
2. Local Authorities to continue to carry out similar maintenance to ordinary watercourses.
3. The NRA to continue to carry out maintenance work to ensure the integrity of existing assets created as part of flood alleviation schemes on main river.

#### PROS & CONS:

The existing level of watercourse and asset maintenance by the NRA is subject to justification, priorities and the availability of limited resources. Such works do not, for example, extend to the removal of general litter, unless the quantities involved pose an actual or potential flood risk. As with any other piece of land, litter is a matter for the relevant riparian owner to address.

With urban development providing a continuing demand for further alleviation schemes, the maintenance requirements of the assets that comprise such schemes continues to increase. If corresponding increases in maintenance funding are not forthcoming, then the relative priorities of asset and watercourse maintenance may have to be re-assessed with on another. This may lead to reductions in maintenance activities in some quarters.

**PARTNERS:** NRA, Local Authorities and MAFF



The NRA has recently completed a fisheries survey for the Crane catchment which will be published in April 1996. In conjunction with the survey that was completed for the Brent catchment in 1994, opportunities for future management and enhancement have been highlighted and will provide the framework for future action.

<b>BRENT AND CRANE CMP KEY ISSUES</b>
<b>ISSUE NO:</b> Fish Management - 1
<b>ISSUE:</b> Fish Management
<p><b>BACKGROUND INFORMATION:</b></p> <p>Whilst the quality of fisheries habitat is predominately poor, with only the lower reaches of the Brent, Crane and Duke of Northumberland's River being of moderate quality, opportunities still exist for enhancing the overall quality of fisheries within the catchments. Fish are an excellent indicator of water quality and could be a useful measure of success or failure of any water quality initiatives that are undertaken in the future. One area of potential enhancement are the mill streams that are found on the back loops of the Crane, which provide excellent sheltered habitats for improvement.</p> <p>The Brent Reservoir raises a number of issues in terms of its future management as a fisheries resource within the Brent catchment. The fish population of the reservoir suffered a major setback in 1995, when maintenance work to the reservoir headwall meant the reduction of water levels and led to many fry being washed downstream. Problems were also encountered over the ownership of the fish within the reservoir during this work.</p>
<p><b>OPTIONS:</b></p> <ol style="list-style-type: none"> <li>1. Clarify the ownership of fish stocks and future management of the Brent Reservoir.</li> <li>2. Using the NRA's fisheries surveys identify schemes within the catchments to improve the fisheries habitat within the river channels.</li> </ol>
<p><b>PROS &amp; CONS:</b></p> <p>Significant improvements in the overall quality of the fisheries in the catchments is unlikely without improvements in water quality. However, opportunities have been identified by the surveys that the NRA have undertaken which will enable a gradual improvement in the ability of the rivers within the catchments to sustain a healthier fish population.</p>
<b>PARTNERS:</b> BW, WHCC, Local Authorities, NRA, EN

*Appendix I:  
Organisation Responsibilities and NRA  
Aims and Strategies*

*Appendix II:  
Report on Informal Liaison*

*Appendix III:  
Supporting Information*

*Appendix IV:  
Glossary*

*Appendix V:  
Bodies Being Consulted On This Plan*

**Introduction**

The purpose of this section of the plan is to identify the organisations who will have a direct influence over the future management of the catchment. The section then moves on to look in detail at the aims and objectives of the NRA.

**Water and Sewerage Undertakers**

These private companies are responsible for providing water supplies and the management of sewage treatment works. Thames Water Utilities, Three Valleys Water PLC and North Surrey Water Company provide these 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.

**London Boroughs**

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 Grand Union Canal is controlled by BW. 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".*

Under the 1995 British Waterways Act, BW now have a duty to conserve and enhance the heritage and natural value of sites through their operations. This represents a formalising of their previous practices.

**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 dischargers 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.*

**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 Statement to protect and improve rivers and coastal waters.

To achieve our Mission Statement we will 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.

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

*Review* — • — — 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 enforce 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.

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***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" refers to an aquatic ecosystem in which fish are, or in natural circumstances would be, the highest form of life living wholly therein. This includes both sport and commercial fisheries but not fish farms which are regulated by MAFF.

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 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 London Boroughs, 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.**

In July 1995, a number of organisations were contacted as part of this Authority's initial consultation on the Brent and Crane catchment plan. The consultation looked towards a wide variety of groups to give feedback on the problems and issues they considered were particularly relevant to these catchments.

In total, 978 organisation were consulted, which included local authorities, central government, conservation groups, schools, local industry and interest groups. Perhaps what was different to previous catchment plans was that with the help of the local authorities, a large number of residents' groups were contacted for their comments.

Due to the large number of organisations being consulted, a three tier approach was adopted, whereby the consultation list was categorised into three priority groups. Those who fell under priority 1 were asked if they would meet with the catchment planning team to discuss the issues relating to the catchment. Priority 2 organisations were asked for their comments, and priority 3 groups were contacted and asked whether they would wish to be involved in the catchment plan process. An example of the organisations in each group is shown below -

*Priority 1 - Local Authorities, British Waterways*

*Priority 2 - RSPB, SERPLAN*

*Priority 3 - Residents Associations, Schools*

Meetings were held during August 1995 with all priority and groups.

As a result of this informal consultation, a number of issues were raised -

- Water Quality** - pollution issues and the quality of water for recreation.
- Flooding** - upstream of the Brent Reservoir on the Silk Stream and Edgware Brook.
- Urbanisation** - the impact of development on flows and channels.
- Recreation** - protecting and promoting future access.
- Conservation** - protecting sites of importance in the catchment.

Of primary concern to local residents seems to be the quality of the water that flows within the rivers, and the potential associated public health risk that could result. Attention was also drawn to the poor habitats found (especially along the Brent), which appeared to be caused by the concrete channels that dominate the rivers. Lack of river maintenance also received a high profile, with the public believing that standards have fallen over recent years. Access is another topic which has been highlighted, with the public becoming increasingly concerned over cyclists using footpaths adjacent to the rivers. Finally the issue of flooding was identified, with questions being asked in relation to future flood protection.

The concerns of the local authorities appeared to be very similar to those of the general public. Flooding and water quality issues dominate their initial feedback, but confusion also exists over the work and responsibilities of the NRA. An issue that was raised by all the Boroughs, was the need to develop a clear drainage policy for both catchments, which at present does not exist.



Comments received from interest groups within the catchments have been wide ranging. The focus of their concerns centre upon protecting and enhancing the natural recreational resource of the catchments, with groups looking to develop facilities for sailing, canoeing and cycling. Problems have also been raised over the sheer amount of rubbish that floats from the river system into the Grand Union Canal. On a slightly different note, the archaeological importance of the river valleys, within the catchments, has also been drawn to our attention.

This informal consultation stage has helped develop the plan into a useful and factually correct document. However, the main problem that has attracted everyone's attention is the issue of water quality within the catchments.

**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.

**Unsubstantiated**

A reported pollution incident which upon investigation proves to be unsubstantiated, ie. no evidence can be found of a pollution incident having occurred.

TABLE 12: BIOLOGICAL MONITORING RESULTS

WATERCOURSE/SITE	NGR	Mean BMWP score (Overall Diversity measure)			Mean ASPT score (Organic Pollution Index)		
		85-89	90-92	93-95	85-89	90-92	93-95
<b>River Brent</b>							
Below Welsh Harp Dam	TQ 2090 8680	33	51	55	3.1	3.7	3.4
Below Barnhill Road	TQ 2030 8610	20	37	24	2.8	3.7	2.7
Below Wembley Brook	TQ 1950 8390	-	-	23	-	-	2.9
Perival Bridge	TQ 1600 8270	21	22	23	2.7	2.9	3.3
Below Costons Brook	TQ 1460 8220	20	-	30	3.3	-	3.0
Above Uxbridge Road, Hanwell	TQ 1510 8040	12	24	26	2.4	3.2	3.2
<b>Brent/GUC</b>							
Below Lock 97	TQ 1520 7960	-	40	-	-	3.6	-
Below Lock 100, Boston Manor	TQ 1670 7780	-	40	36	-	3.3	3.0
<b>Clitterhouse Brook</b>							
Clitterhouse Recreation Ground	TQ 2390 8730	-	18	20	-	2.6	2.8
<b>River Crane (incl. Yeading Brook)</b>							
At Charville Lane	TQ 0980 8350	-	-	50	-	-	3.7
Above Hayes Bypass	TQ 1140 8160	-	-	60	-	-	3.8
At Brookside Road	TQ 1160 8130	-	-	61	-	-	3.8
At Watersplash Lane	TQ 1040 7850	26	55	68	2.9	3.5	3.7
Above Duke of N River (Upper)	TQ 1120 7470	45	71	73	3.5	4.0	4.0
At Crane Park, Hanworth	TQ 1320 7280	-	66	91	-	3.9	4.3
Below Northcote Road	TQ 1630 7480	43	51	57	3.4	3.5	3.7
<b>Costons Brook(s)</b>							
Above Rowdell Road, Bellvue Pk	TQ 1330 8380	-	9	40	-	2.3	3.3
Old Gaytonians Sports Ground	TQ 1550 8600	-	17	-	-	2.8	-
Above Rockware Road	TQ 1530 8410	-	28	-	-	3.5	-
Greenford Golf Course	TQ 1520 8420	-	-	55	-	-	3.9
Above Brent	TQ 1490 8240	-	7	24	-	2.3	3.0
<b>Deans Brook</b>							
Above Stoneyfields Lake	TQ 2040 9380	-	-	74	-	-	4.1
Below Stoneyfields Lake	TQ 2030 9300	-	-	53	-	-	3.5
Above Edgware Brook	TQ 1990 9130	-	-	23	-	-	2.9
<b>Dollis Brook</b>							
Below Ducks Island	TQ 2460 9520	-	-	36	-	-	3.3
At Woodside Park	TQ 2540 9230	27	29	33	3.5	3.6	3.3
Above Waverley Grove	TQ 2420 9040	-	43	-	-	3.6	-
At Bell Lane	TQ 2400 8910	24	24	29	3.0	3.0	3.0
<b>Duke of Northumberlands River (Upper)</b>							
At Moor Lane, Heathrow	TQ 0550 7760	-	-	126	-	-	4.9
Perry Oaks STW (natural bed)	TQ 0530 7570	-	-	145	-	-	4.8
Perry Oaks STW (concrete bed)	TQ 0530 7600	-	-	79	-	-	4.7
Adj. Southern Perimeter Road	TQ 0650 7400	-	-	76	-	-	4.2
Above Two Bridges	TQ 0880 7430	-	88	133	-	4.6	4.9
At River Gardens	TQ 1110 7460	89	98	116	4.3	4.4	4.5



TABLE 12 : BIOLOGICAL MONITORING RESULTS

WATERCOURSE/SITE	NGR	Mean BMWP score (Overall Diversity measure)			Mean ASPT score (Organic Pollution Index)		
		85-89	90-92	93-95	85-89	90-92	93-95
<b>Duke of Northumberland's River (Lower)</b>							
At Worton Road	TQ 1530 7550	47	79	96	3.5	4.3	4.6
<b>Edgware Brook</b>							
Below Methuen Road	TQ 1920 9130	-	-	43	-	-	3.3
Prince Edward Playing Fields	TQ 1850 9100	-	45	-	-	3.8	-
<b>Edgwarebury Brook</b>							
Edgwarebury Park	TQ 1870 9340	-	-	37	-	-	3.7
Above Hale Lane, Edgware	TQ 1960 9230	-	-	30	-	-	3.0
<b>Folly Brook</b>							
At Holcombe Hill, Barnet	TQ 2220 9340	-	-	37	-	-	4.6
Above Ornamental Water	TQ 2360 9310	-	-	36	-	-	3.6
Above Dollis Brook	TQ 2540 9250	-	-	38	-	-	3.6
<b>Frogs Ditch</b>							
Cranford Park	TQ 0980 7790	-	18	-	-	3.0	-
Grand Union Canal (Cowley Reach)							
Above Horton Road Bridge	TQ 0660 8010	-	80	101	-	4.3	5.0
Above Dawley Road, Hayes	TQ 0880 8010	-	-	67	-	-	4.5
Above A312 Hayes Bypass	TQ 1050 7920	-	-	54	-	-	3.9
<b>Grand Union Canal (Paddington Arm)</b>							
Below Bulls Bridge	TQ 1070 7920	-	-	64	-	-	4.0
Below A40 Western Avenue	TQ 1360 8390	-	-	88	-	-	4.6
Below Horsenden Lane	TQ 1610 8390	-	-	50	-	-	3.6
At Northfield Ind. Estate, Alperton	TQ 1920 8370	-	-	48	-	-	3.4
<b>Honeypot Ditch</b>							
At Queensbury Park	TQ 1870 8940	-	-	29	-	-	3.2
<b>Mitchell Brook</b>							
Above Brentfield Road	TQ 2080 8490	-	-	21	-	-	2.6
<b>Mutton Brook</b>							
Northway Gardens, Finchley	TQ 2590 8890	-	-	15	-	-	2.5
<b>Preston Brook</b>							
Below Harrow School Lake	TQ 1570 8700	-	-	38	-	-	3.8
<b>Silk Stream</b>							
At Rushgrove Park	TQ 2170 8940	30	27	39	3.0	3.0	3.2
<b>Watling Brook</b>							
Below Abbots Road, Watling Park	TQ 2050 9140	-	-	21	-	-	2.6
<b>Wealdstone Brook</b>							
At Woodcock Park	TQ 1760 8860	-	-	31	-	-	3.1
Below End Road	TQ 1970 8610	-	-	32	-	-	3.2
<b>Wembley Brook</b>							
At Stonebridge Park Station	TQ 1970 8420	-	-	26	-	-	2.9
<b>Wemborough Ditch</b>							
Wemborough Sports Ground	TQ 1740 9110	-	-	58	-	-	3.6
Yeading Brook - see Crane							
<b>Yeading Brook East</b>							
At Malvern Avenue, Eastcote	TQ 1290 8650	-	-	33	-	-	3.2
Above Western Avenue (A40)	TQ 1120 7850	18	15	31	3.0	2.6	3.1
<b>Yeading Brook West</b>							
Above Priory Way, Headstone	TQ 0140 8940	-	-	26	-	-	2.9
Suffolk Road, N. Harrow	TQ 0130 8860	-	-	28	-	-	2.9
Below Western Avenue	TQ 0870 8440	34	40	43	3.4	3.5	3.4

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 <sub>3</sub>	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 <sup>1</sup> )	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
	E	20	15	9.0
Bad	F <sup>2</sup>	-	-	-
<sup>1</sup> as suppressed by adding allyl thio-urea				
<sup>2</sup> ie quality which does not meet the requirements of grade E in respect of one or more determinants				

TABLE 15 : BACTERIOLOGICAL QUALITY  
BRENT CATCHMENT

SITE (1994 Survey data)	1st Quarter		2nd Quarter		3rd Quarter		4th Quarter	
	T.C.	F.C.	T.C.	F.C.	T.C.	F.C.	T.C.	F.C.
<b>Brent</b>								
Priestley Way	280,000	29,000	310,000	12,000	330,000	21,000	24,000	9,400
d/s Welsh Harp	435,000	46,000	340,000	32,000	360,000	110,000	28,000	4,200
Western Avenue	190,000	12,000	470,000	37,000	140,000	6,600	59,000	6,100
Uxbridge Road	575,000	62,000	950,000	5,900	270,000	33,000	170,000	11,800
Lock 100	23,000	4,000	20,000	800	69,000	7,400	1,120,000	155,000
<b>Dollis Brook</b>								
Abercorn Road	160,000	28,000	> 1,500,000	410,000	> 1,500,000	280,000	220,000	38,000
u/s Mutton Brk	135,000	9,000	35,000	3,600	400,000	110,000	180,000	61,000
<b>Mutton Brook</b>								
Cherry Tree Wood	425,000	90,000	> 1,500,000	> 1,500,000	> 1,500,000	1,290,000	320,000	270,000
Belvedere Court	> 1,000,000	870,000	> 1,500,000	1,290,000	> 1,500,000	1,030,000	310,000	150,000
Addison Way	80,000	10,000	80,000	28,000	250,000	46,000	330,000	37,000
u/s Dollis Brook	65,000	30,000	220,000	51,000	160,000	38,000	460,000	59,000
<b>Decoy Brook</b>								
u/s Brent	10,000	1,000	150,000	52,000	56,000	14,000	72,000	42,000
<b>Clitterhouse Brook</b>								
u/s Brent	1,400	1,400	12,000	3,100	66,000	15,000	220,000	43,000
<b>Wealdstone Brook</b>								
Becmead Avenue	760,000	285,000	> 1,500,000	1,350,000	> 1,500,000	660,000	124,000	21,000
Preston Hill	1,050,000	670,000	230,000	81,000	> 1,500,000	440,000	330,000	69,000
u/s Brent	110,000	10,000	490,000	220,000	290,000	47,000	81,000	17,000
<b>Kenton Brook</b>								
Mary Close	540,000	270,000	850,000	580,000	> 1,500,000	760,000	250,000	250,000
<b>Mitchell Brook</b>								
u/s Brent	165,000	4,000	250,000	110,000	190,000	21,000	140,000	3,900
<b>Wembley Brook</b>								
u/s Brent	95,000	12,000	13,000	2,000	45,000	13,000	280,000	160,000
<b>Customs Brook</b>								
Perivale Park outfall	160,000	33,000	240,000	33,000	490,000	92,000	130,000	53,000
u/s Brent	250,000	31,000	150,000	16,000	170,000	24,000	230,000	170,000
<b>Broadfields Ditch</b>								
Warwick Avenue	20,000	4,000	380,000	480,000	490,000	230,000	380,000	190,000
u/s Deans Brook	155,000	9,000	240,000	100,000	> 1,500,000	310,000	430,000	200,000
<b>Edgwarebury Brook</b>								
u/s Deans Brook	815,000	170,000	320,000	49,000	780,000	430,000	850,000	86,000
<b>Deans Brook</b>								
Edgware Hospital	30,000	4,000	380,000	23,000	530,000	240,000	83,000	8,500
<b>Edgware Brook</b>								
Edgware Hospital	825,000	15,000	630,000	130,000	420,000	170,000	190,000	20,000
<b>Watling Brook</b>								
Watling Park	98,000	22,000	170,000	17,000	130,000	15,000	46,000	4,000
<b>Tramway Ditch</b>								
Capitol Estate		27,000		9,000	> 1,500,000	250,000	> 1,500,000	160,000
<b>Silk Stream</b>								
Silk Bridge, Rushgrove Pk.	130,000	37,000	110,000		20,000	3,200	48,000	4,600

**Key**

T.C. - total coliforms/100ml    F.C. - faecal coliforms/100ml



**TABLE 15 : BACTERIOLOGICAL QUALITY  
CRANE CATCHMENT**

SITE (1994 Survey data)	NGR	1st Quarter		2nd Quarter		3rd Quarter		4th Quarter	
		T.C.	F.C.	T.C.	F.C.	T.C.	F.C.	T.C.	F.C.
<b>Roxbourne</b>									
Rayners Lane	TQ 1355 8655	135,000	17,000	29,000	3,200	70,000	8,400	16,000	6,500
<b>Yeading Brook</b>									
(East) d/s Victoria Rd Culvert	TQ 117 853	65,000	5,000	160,000	25,000	16,000	9,000	20,000	5,200
(East) Western Avenue	TQ 110 844	215,000	17,000	130,000	3,000	250,000	46,000	5,600	700
(West) Western Avenue	TQ 083 845	50,000	6,000	-	-	-	-	-	-
North Hyde Road	TQ 104 789	18,000	2,900	10,000	1,700	3,800	600	4,000	300
<b>Crane</b>									
u/s Duke of Northumberland River	TQ 111 746	17,000	1,000	46,000	4,000	3,100	1,600	7,200	1,400
<b>(1995 Survey)</b>									
<b>Crane Catchment</b>									
Roxbourne, Rayners Lane	TQ 1355 8655	20,000	13,000	110,000	13,000			170,000	7,800
Yeading Bk East u/s Priors Farm	TQ 1117 8452	5,000	1,600	4,500	880			90,000	16,000
Yeading Bk West, Western Avenue	TQ 0837 8453	14,000	2,600	3,700	510			17,000	3,100
Yeading Bk, North Hyde road	TQ 1041 7889	12,000	2,600	3,600	1,200			48,000	3,900
Crane at the Causeway	TQ 1063 7551	14,000	4,000	8,700	2,100			16,000	1,160
Crane u/s Duke of Northumberland	TQ 1116 7466	18,000	3,600	6,200	1,100			9,000	1,900
Crane at Northcote Rd	TQ 1634 7477	31,000	20,000	3,800	770			23,000	3,400
Dukes (Upper) at River Gardens	TQ 1099 7462	6,000	1,300	680	340			530	410
Dukes (Lower) Kidds Mill	TQ 1658 7596	12,000	3,000	14,000	1,500			8,000	3,100

• **Key**

T.C. - total coliforms/100ml  
F.C. - faecal coliforms/100ml

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**NRA POLICY STATEMENTS ON LICENSING ABSTRACTIONS**

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**Introduction**

The abstraction of water is controlled by the Water Resources Act 1991 . This summary presents the key policies 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.

**NRA POLICY STATEMENTS ON LICENSING ABSTRACTIONS - (Continued)****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.

**Abstractions for Spray 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.



## FURTHER INFORMATION

For further details on any of the above mentioned documents, aspects of the plan or general queries about rivers or the NRA, please call our offices on 01992 635566 and ask for:

TABLE 16 : WHO DOES WHAT IN THE NRA

DEPARTMENT	FUNCTION
HYDROMETRY	hydrological information
POLLUTION CONTROL	surface water and groundwater quality information
BIOLOGY	biological information
WATER RESOURCES	water quantity and abstraction licencing information
FISHERIES	fishery information
PLANNING LIAISON	development and flooding information
CATCHMENT MANAGEMENT	other information and general points

78\659\EEC	-	The EC Directive on the quality of Fresh Waters needing protection or improvement to support fish life.
AMP	-	Asset Management Plan - relates to privatised water companies
AOD	-	Above Ordnance Datum
AONB	-	Area of Outstanding Natural Beauty as designated by the Countryside Commission
AQC	-	Analytical Quality Control
Aquifer	-	A layer of underground porous rock which contains water and allows water to flow through it
ASPT	-	Average Species Per Taxa
BAA	-	British Airports Authority
BC	-	Borough Council
BCU	-	British Canoe Union
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.
BTCV	-	British Trust for Conservation Volunteers
BW	-	British Waterways
CAP	-	Common Agricultural Policy
Catchment	-	Area from which rainfall flows into a river
CHEAT	-	Chironomid Exuviae Assessment Technique
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.
CC	-	County Council
CSO	-	Combined Sewer Overflows, sewers which carry both surface and foul water need overflow facilities into rivers for heavy storms.
Culvert	-	Placing a river underground in a pipe.
Cyprinid	-	Coarse fish of the Carp family ie. 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
DON	-	Duke of Northumberland's River
DOT	-	Department of Transport
DTI	-	Department of Trade and Industry
DWI	-	Drinking Water Inspectorate
E. coli	-	<i>Escherichia Coli</i>
EC	-	European Commission
ECSR	-	Eastern Council for Sports and Recreation
EH	-	English Heritage
EN	-	English Nature
ENVAGE	-	The Environment Agency
Environmental Capacity	-	The point at which development passes from being sustainable to unsustainable.
EU	-	European Union

European LIFE		
Fund	-	Financial Instrument for the Environment
Eutrophic	-	Water with very high nutrient levels
EQI	-	Ecological Quality Index
Faecal		
coliform	-	Bacteria of the intestine
Fauna	-	Animals, birds, insects
FC	-	faecal coliforms
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
FoE	-	Friends of the Earth
GOL	-	Government Office for London
GQA	-	General Quality Assessment
Groundwater	-	Underground water contained in the pores and fissures of aquifers (water bearing strata)
GUC	-	Grand Union Canal
HMIP	-	Her Majesty's Inspectorate of Pollution
Hypertrophic	-	Water with nutrient levels even higher than eutrophic
IFE	-	Institute of Freshwater Ecology
LA	-	Local Authority
LB	-	London Borough
LBBA	-	London Borough of Barnet
LBRR	-	London Borough of Brent
LEU	-	London Ecology Union
LFRC	-	River Lee Flood Relief Channel
Local Plan	-	Statutory plan to shape development within each district outside London
LPAC	-	London Planning Advisory Committee
LSC	-	London Sports Council
LWT	-	London Wildlife Trust
MAFF	-	Ministry of Agriculture, Fisheries and Food
Misconnection		Connected foul water pipes to the surface water sewer
MOL	-	Metropolitan Open Land
MOD	-	Ministry of Defence
MP	-	Member of Parliament
MPPA	-	Million Persons Per Annum
MRL	-	Main River Limit
NGR	-	National Grid Reference
NRA	-	National Rivers Authority
NRA TR	-	National Rivers Authority Thames Region
NSWC	-	North Surrey Water Company
NVZ	-	Nitrate Vulnerable Zone
NWC	-	National Water Council
OFWAT	-	Office of Water Services
PLA	-	Port of London Authority
PWQO	-	Provisional Water Quality Objectives
RE	-	River Ecosystem



Riparian		
Owner	-	A person/organisation with property rights on a river bank
RPG	-	Regional Planning Guidance
RQO	-	River Quality Objective
RSPB	-	Royal Society for the Protection of Bird
Salmonids	-	Fish classified as belonging to the Salmon family ie. salmon, trout, char etc.
SAM	-	Scheduled Ancient Monument
SC	-	Sports Council
SERPLAN	-	The London and South East Regional Planning Conference
SMI	-	Site of Metropolitan Importance
SNCI	-	Site of Nature Conservation Interest
SoS	-	Standards of Service
SPA	-	Special Protection Area
SRB	-	Single Regeneration Budget
SSSI	-	Site of Special Scientific Interest
STW	-	Sewage Treatment Works
SWQO	-	Statutory Water Quality Objective
Taxa	-	Classification of groups of fauna
TC	-	total coliforms
TVWS	-	Three Valleys Water Services PLC
TWUL	-	Thames Water Utilities Limited
UDP	-	Unitary Development Plan - statutory plan to shape development within each Borough
WHCC	-	Welsh Harp Consultative Committee
WHSC	-	Welsh Harp Sailing Club
WQO	-	Water Quality Objective
WLMP	-	Water Level Management Plans
WLWW	-	West London Waterway Walks

### Units

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

## APPENDIX V

## ORGANISATIONS CONSULTED

Access in Barnet	Botwell Tenants & Residents Association
Acorn Residents Association	Bovis Homes
Action Sports	BP Exploration Operation Co.
Acton High School	Brearley Close Residents Association
Acton Housing Association	Brent & Harrow Co-operative Party
Age Concern	Brent & Harrow Parents Group
Airways Housing Association	Brent Active Pensioners
Albany College	Brent Association of Disabled People
All Muslim Women's Association	Brent Business Venture
Allburn Residents & Tenants Association	Brent Chamber of Commerce
Alperton High	Brent Community Liaison Officer
Alpha/Gorefield Tenants' Association	Brent Community Relations Council
Alston Road GIA Residents Committee	Brent Community Transport
Amalgamated Wembley Residents Association	Brent Elderly House Owners Advice Service
Amateur Rowing Association	Brent Friends of the Earth
Anchor Housing Association	Brent Green Party
Ashmole School	Brent Private Tenants Right Group
Asian People with Disabilities Alliance	Brent Residents and Tenants Association
Association of British Chambers of Commerce	Brent River & Canal Society
Association of Hillingdon Chamber of Trade, Commerce & Ind.	Brent Sports Council
Association of Metropolitan Authorities	Brent Tenants Action Group
Association of the Residents of The Drive	Brent Terrace Residents Association
Association of Waterways Cruisers Club	Brent Trades Council
Aylestone Playing Field Petition	Brentford & Chiswick History Society
B.T.C.V.	Brentford School For Girls
Bailey Housing Association	Brentside High School
Barham Park Residents Association	British Aggregates & Construction Materials Ind.
Barn Hill Conservation Group	British Airways Plc
Barn Hill Residents Association	British Association of Chambers of Commerce
Barn Hill Residents & Tenants Association	British Butterfly Conservation Society
Barnet & District Local History Society	British Canoe Union
Barnet Allotment & Horticultural Societies	British Dragon Boat Racing Association
Barnet Borough Voluntary Service Council	British Gas Properties
Barnet Friends of the Earth	British Rail Property Board
Barnet Wildlife Group	British Sports Association for the Disabled
Barnets Residents Association	British Telecom, Northern London
Barons Court Resident's Association	British Waterways
Barry Road Estate Tenants & Residents Association	Brockley Hill Residents Association
Beazer Homes Southern Ltd	Brondesbury Community Association
Belvue School	Brondesbury Residents/Tenants Association
Beth Jacob Grammar School for Girls	Brondesbury Road Neighbourhood Association
BFI Wastecare	Brook Green Residents Association
Birchen Grove Residents Association	Brunel University
Bishop Douglas R.C. School	Canal Locks Advisory Panel
Bishop Ramsey C.E. School	Capital and Counties Plc
	Cardinal Hinsley High R.C.

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## APPENDIX V

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## ORGANISATIONS CONSULTED

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Cardinal Wiseman R.C. High School  
Carlton House Tenants Association  
CBI London Region  
Chalkhill Tenants & Residents Association  
Chalklands Residents' Association  
Chapel End Residents & Tenants Association  
Chapman Warren Town Plng & Develop Consultants  
Charles Church Developments Ltd  
Chipping Barnet Conservation Association  
Chiswick Community School  
Christ Church C.E. School  
Christ's College  
Church End Residents & Tenants Association  
Church End Trades Association  
Citizen Advice Bureau  
Civic Trust  
Civil Aviation Authority  
Cliffhurst Residents Association  
Clr Chris Platford  
Co-op Home Services  
College Farm Residents Association  
College Park Residents Association  
Colne Valley Water Company  
Colney Hatch Management Co.  
Common Ground  
Commons, Open Spaces Footpaths Soc.  
Confederation of British Industry (Eastern Region)  
Conservation Trust c/o Environmental Council  
Convent of Jesus & Mary R.C. High  
Copland Community & Technology Centre  
Cophall School  
Council for British Archaeology  
Council for the Protection of Rural England  
Councillor F E Poole  
Countryside Commission  
Court Drive Householders Association  
CPRE North London Branch  
Cranford Community School  
Cricklewood Neighbourhood Association  
Cricklewood Residents Association  
Cromer Rd & Shaftesbury Ave Residents Action Comm.  
Crown Estates Commissioner  
Cunname Associates

Cycling Council of Great Britian  
Cyclist Touring Club  
Dene Road Residents Association  
Department of National Heritage  
Department of the Environment  
Department of Trade and Industry, South East  
Department of Transport (Highways Agency)  
Dollis Hill Residents Association  
Dollis Park and District Residents Association  
Donnington Court Residents Association  
Dormers Wells High School  
Drayton Manor High School  
Drinkwater Sabey Ltd  
Dunstan Road Residents Association  
Ealing Family Housing Association  
East Barnet Parish Residents Association  
East Barnet Residents Association  
East Barnet School  
East Finchley Community Forum  
East Finchley Village Society  
Eastcote Chamber of Commerce  
Eastcote Park Estate Association  
Eastcote Residents Association  
Eastern Electricity  
Edgware and Burnt Oak Chamber of Commerce  
Edgware School  
Edgwarebury Liaison Group  
Edgwarebury Residents Association  
Ellen Wilkinson High School  
Elstree and Borehamwood Historical Research Group  
Elstree and Borehamwood Green Belt Society  
English Churches Housing Group  
English Heritage  
English Nature, Essex, Herts & London  
English Tourist Board  
Equal Oppor. Greater Lon. Assoc. For Disabled People  
Evelyns School  
Fairfield Association  
Fairview New Homes Plc  
Family Housing Association  
Farming & Wildlife Advisory Group  
Featherstone High School



## APPENDIX V

## ORGANISATIONS CONSULTED

Feltham Community School  
Ferndale Area Residents Association  
Finchley & Friern Barnet Conser. Unionist & Assoc.  
Finchley C.A.A.C.  
Finchley Catholic High School  
Finchley Community forum  
Finchley Gdn Vlge Res Assc & Neighbourhood Watch  
Finchley Local Action Group  
Finchley Park Residents Association  
Fitzjohn Avenue & Area Residents Association  
Forestry Authority Thames/Chiltern Conservancy  
Forestry Commission, East England Conservancy  
Frays Housing Association  
Freehold Residents Association  
Friends of the Earth  
Friends of Warrender Park  
Friern Barnet and Whetstone Residents Association  
Friern Barnet Grammar School  
Friern Barnet Rate Payers Association  
Friern Watch Avenue Residents Association  
Gatehill Residents Association  
Gayton High School  
Gledwood Residents Association  
Golders Green Chamber of Commerce  
Golders Green Residents Association  
Grahame Park Residents Association  
Greater London Council for Sport & Recreation  
Greenford High School  
Greenway Conservation Area  
Grove Park School  
H.M. Inspectorate of Pollution  
Hadley Residents Association  
Haig Rd. & Collingwood Rd. Residents & Tenants  
Hale Association  
Hampstead Garden Suburb Residents Association  
Harefield Common Association  
Harefield History Society  
Harefield Tenants Residents Association  
Harlington Community School  
Harlington Rectory Housing Association

Harlington Village Association  
Harmondsworth & Longford Conservation Panel  
Harmondsworth & Sipson Residents Association  
Harrow Hill Chamber of Commerce  
Harrow Natural History Society  
Harry Greenway MP  
Hasmonean High School  
Hatch End High School  
Hay Lane School  
Haydon School  
Hayes & Harlington Local History Society  
Hayes and Harlington Community Association  
Hayes Manor School  
Hayes Town Centre Residents Association  
Hayes Village Conservation Panel  
Heathcroft Residents Association  
Heathland School  
Heathrow Airport Ltd  
Hendon (South) Conservative Association  
Hendon & District Archaeological Society  
Hendon and District Archaeological Society  
Hendon and District Chamber of Commerce  
Hendon North Conservation Association  
Hendon North Labour Party  
Hendon School  
Hendon South Constituency Labour Party  
Hendon Times Newspaper Group  
Henrietta Barnet School  
Hertford Natural History Society & Field Club  
Herts & Middlesex Wildlife Trust  
Heston Community School  
High Barnet Community Forum  
Highlands Residents Association  
Hillingdon Allotments & Horticultural Federation  
Hillingdon Community Association  
Hillingdon Federation of Residents & Tenants Assoc.  
Hillingdon Green Party  
Hillingdon Independent Living Centre  
Hillingdon Natural History Society  
Hillingdon Ramblers Association Group  
Hillingdon Village Conservation Panel  
Hillingdon Village Residents Association  
Holden Road Action Group

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## APPENDIX V

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## ORGANISATIONS CONSULTED

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Hounslow Ecology Forum	London Borough of Hounslow
Hounslow Manor School	London Borough of Barnet
House Builders Federation	London Borough of Haringey
Humanist Housing Association	London Borough of Ealing
Ickenham Residents Association	London Borough of Enfield
Ickenham Village Conservation Panel	London Borough of Richmond upon Thames
Inland Waterways Association (Middlesex Branch)	London Borough of Hillingdon
Innisfree Housing Association	London Boroughs Association
Inquilab Housing Association	London Canals Committee
Institute of Fisheries Management - London	London Chamber of Commerce and Industry
Institute of Fresh Water Ecology	London Cycling Campaign (Barnet Group)
Isleworth and Syon School for Boys	London Cycling Campaign
J Sainsbury Plc	London Ecology Unit
John Busch School	London Electricity Plc
John Chilton School	London Fire & Civil Defence Authority (LFCDA)
John Grooms Housing Association	London Fire Brigade
John Kelly High School	London Forum of Greater London
John Lewis Plc	London Green Belt Council
Joint Committee on Mobility for Disabled People	London Natural History Society
Kilburn Police Station	London Planning Advisory Committee
King Alfred School	London Rivers Authority
Kingsbury High School	London Tourist Board & Convention Bureau
Kisharon Senior Centre	London Tourist Board
Labour Party (Chipping Barnet)	London Tree Forum Secretariat
Laing Field Residents Association	London Waste Regulation Authority
Laing Homes Ltd	London Wildlife Trust
Laingfield & Moat Mount Residents Association	Long Lane GIA Residents Committee
Lampton School	Longford Community School
Langham Court Residents Association	Longford Residents Association
Larch Crescent Residents Association	Lovell Homes London Ltd
Latimer Road Conservation Group	Lyonsdown Residents Group
Lawn Road Residents Association	Marjory Kinnon School
Lime Gr. & Eastcote Allotments Association	Melbourne House Residents Association
Local History Society	Mellow Lane School
London & Middlesex Archaeological Society	Melvin Hall Residents Association
London Accessible Transport Unit	Menorah Grammar School
London Amenity & Transportation Association	Metropolitan Housing Trust
London Angling Association	Middlesex Federation of Womens Institutes
London Borough of Brent	Mill Hill and Belmont Schools
London Borough of Harrow	Mill Hill C.A.A.C.
London Borough of Camden	Mill Hill County High
London Borough of Southwark Council Offices	Ministry of Agriculture, Fisheries & Food
	Ministry of Defence
	Monken Hadley Common Trustees
	Monkey Hadley & Wood St C.A.A.C.
	Moxon Street Residents Association
	MP - Alan Keen

## APPENDIX V

## ORGANISATIONS CONSULTED

MP - Harry Greenway  
MP - Hariley Booth  
MP - Hugh Dykes  
MP - John Marshall  
MP - John Wilkinson  
MP - Ken Livingstone  
MP - M Shersby  
MP - Nirj Deva  
MP - P S Khabra  
MP - Paul Boateng  
MP - Robert Hughes  
MP - Sidney Chapman  
MP - Terry Dick  
MP - Sir George Young  
MP - Sir John Gorst  
MP - Sir Rhodes Boyson  
Murco Petroleum Ltd  
Museum of London  
National Association of Boatowners  
National Farmers Union  
National Playing Fields Association  
National Power  
National Trust  
Network Housing Association  
New & East Barnet Community Forum  
New Barnet Residents Association  
New Era Housing Association  
Nicholas Way Residents Association  
North British Housing Association  
North Hayes Residents Association  
North London & Herts Newspaper  
North London Chamber of Commerce  
North Thames Gas  
North Uxbridge Residents Association  
Northcote Housing Association  
Northolt High School  
Northwood District Association  
Northwood Hills Residents Association  
Northwood Residents Association  
Notting Hill Housing Association  
Nower Hill High School  
Oak Farm Residents Association  
Oaklands School  
Oakleigh Park Residents Association  
Old Uxbridge Cons. Area Advisory Panel  
Open Spaces Society  
Pardes House Grammar School  
Park High School  
Park Triangle Residents Group

Pearse Prentise Town Plng & Develop  
Consultants  
Pentland Industries Plc  
Percy Road GIA: Residents Committee  
Planning Aid for London  
Preston Manor High  
Queen Elizabeth's Boys' School  
Queen Elizabeth's Girls' School  
Queens Park Community School  
Queensmead School  
R.A.I.D.  
Railtrack Property  
Ramblers Association - Herts & North  
Middlesex  
Ramblers Association - W London  
Ravenscroft Court Residents Association  
Ravenscroft School  
Ravensdale Residents Association  
Redlands Aggregates  
Residents Community Association (Edgware  
Road)  
River Thames Society Lower Tideway  
Branch  
Road Haulage Association Ltd  
Roadside Developments  
Rodwell Close Residents Association  
Rooks Heath High School  
Royal Commission - Historial Monuments  
of England  
Royal Mail Letters  
Royal Society for the Protection of Birds  
Ruislip Allotment Association  
Ruislip and District Natural History Society  
Ruislip Chamber of Commerce  
Ruislip Conservation Area Panel  
Ruislip Natural History Society  
Ruislip Northwood Co-op S/Hldngs &  
Allotment Soc.  
Ruislip Northwood Constituency Labour  
Party  
Ruislip Northwood-E Cote Local History  
Society  
Ruislip Residents Association  
Rural Development Commission  
Sacred Heart High School  
Salmon & Trout Association  
Sanctuary Housing Association  
Sand and Gravel Association



School of Geography, University of North London  
SERPLAN  
Shaftesbury Housing Association  
Shepherds Bush Housing Association  
Society for the Protection of Ancient Buildings  
Society for the Protection of Ancient Buildings  
South Ruislip Residents Association  
Southern Community Forum  
Sports Council - London Region  
Springhallow School  
St. Ann's School  
St. Anslems & Neild Road Resident Association  
St. Gregory's High R.C. School  
St. James' Catholic High School  
St. Lawrence (Cowley) Residents Association  
St. Mark's R.C. School  
St. Martha's Convent School  
St. Mary's C.E. High School  
St. Michael's R.C.  
STC Telecommunication  
Strawberry Vale Tenants Association  
Sunbury and Maxwelton Residents Association  
Taylor Woodrow Homes Ltd  
Thames Valley Housing Association  
Thames Water Plc  
The Barnet Society  
The Compton School  
The Dell (Northwood) Residents Association  
The Finchley Society  
The Friends of Hillingdon House Farm  
The Green School for Girls  
The Guinness Trust  
The Hampstead Garden Suburb Residents Association  
The Lindon-Bennett School  
The London Forum of Gtr. London Amenity Societies  
The Mill Hill Preservation Society  
The Mount School  
The National Grid Company Plc  
The New Hampstead Garden Suburb Trust Ltd  
The Open Spaces Society

The Planning Bureau  
The Ramblers Association  
The Residents of Holders Hill Avenue  
The South Friern Community Forum  
The Whetstone Society  
Torrington & Friary Residents Association  
Totteridge C.A.A.C.  
Totteridge Farm Residents Management Ltd  
Totteridge Lane and Area Residents Association  
Totteridge Manor Association  
Totteridge Ratepayers and Residents Assoc.  
Transport 2000  
Tudor Way Residents Association  
Twyford C.E. High School  
University College School  
University of Hertfordshire  
Uxbridge College  
Uxbridge Moor Residents Association  
Villiers High School  
Vine Lane Residents Association  
W/Drayton Amenity Association  
W/Drayton General Conservation Area Advise Panel  
Walford High School  
Waltham Residents Association  
Warden Housing Association  
Watch Across Barnet  
Weatherall Green Smith  
Welsh Harp Conservation Group  
Welsh Harp Sailing Association  
Wembley High School  
West Drayton Conservation Advise Panel  
West Drayton Residents Association  
West End Lane Residents Association  
West Hampstead Housing Association  
West London Waste Authority  
West London Waterway Walks  
Westcroft Tenants and Residents Association  
Whetsone and Finchley Pensioners voice  
Whitefield School  
Whitehall Residents Association  
Whitmore High School  
Willesden High School  
Wimpey Homes Holdings Ltd  
Woodfield School  
Woodhouse 6th Form College  
Woodside Park Residents Association