

National Rivers Authority
Thames Region - Western Area

Isis House
Howbery Park
Wallingford
Oxon OX10 8DB

RIVER CHERWELL

Consultation Report

NOVEMBER 1994

ENVIRONMENT AGENCY



122557

CONTENTS

	THE DRAFT VISION - RIVER CHERWELL CATCHMENT	iv
1	INTRODUCTION	1
	The National Rivers Authority	
	Catchment Management Planning	
2	CATCHMENT DESCRIPTION	3
	Introduction	
	Overview of the Catchment	
	Topography	
	Geology and Hydrogeology	
	Rainfall and River Flow	
	Strategic and Local Planning	
3	CATCHMENT USES AND RESOURCES	19
	Introduction	
	Nature Conservation	
	Landscape	
	Heritage	
	Amenity and Recreation	
	Fisheries	
	Navigation	
	Water Abstraction	
	Effluent Disposal	
	Rural Land Use	
	Urban Land Use	
	Mineral Extraction and Solid Waste Disposal	
	Flood Defence	
4	CATCHMENT STATUS	60
	Introduction	
	Water Quality	
	Water Resources	

	Physical Features	
5	CATCHMENT ISSUES AND OPTIONS FOR ACTION	85
	Introduction	
6	THE NEXT STEPS	102

APPENDICES

- Appendix A: NRA Aims and Strategies and Organisational Responsibilities
- Appendix B: Results of Informal Liaison
- Appendix C: Supporting Information
- Appendix D: Glossary

LIST OF FIGURES

- Figure 1: Overview
- Figure 2: Topography
- Figure 3: Solid Geology
- Figure 4: Rainfall and River Flow
- Figure 5: Yearly Rainfall
- Figure 6: Yearly Percolation
- Figure 7: Hydrographs
- Figure 8: Nature Conservation
- Figure 9: Landscape and Heritage
- Figure 10: Amenity and Recreation
- Figure 11: Fisheries
- Figure 12: Navigation
- Figure 13: Water Resources and Abstractions >1 Ml/day
- Figure 14: Consented Discharges
- Figure 15: Effluent Disposal
- Figure 16: Urban Land Use
- Figure 17: Mineral Extraction and Solid Waste Disposal
- Figure 18: Flood Defence
- Figure 19: Water Quality: General Quality Assessment

Figure 20: Water Quality: EC Directive Designations

Figure 21: Water Quality: Biological

LIST OF TABLES

Table 1:	Catchment Area by County and District Council
Table 2:	SSSIs within the River Corridor
Table 3:	Mean Licensed and Actual Abstractions (MI/day)
Table 4:	Abstractions of Greater than 1 MI/day
Table 5:	Sewage Effluent Discharges Greater than 1,000 m ³ /day
Table 6:	Land Use Bands
Table 7:	Descriptions of Five River Ecosystem Classes
Table 8:	Water Quality Objectives for Rivers in the Cherwell Catchment
Table 9:	Reaches of Watercourses Demonstrating Poor Faunal Diversity and Possible Causes
Table 10:	Reported Pollution Incidents by Type (1990-1993)
Table 11:	Classes of Reported Pollution Incidents (1990-1993)
Table 12:	Reaches Not Yet Achieving Their WQOs

THE DRAFT VISION - RIVER CHERWELL CATCHMENT

In preparing the catchment vision, the NRA has defined what it would wish the catchment to be and the principle we will be following in working towards that vision. The catchment vision may not be something that can be achieved in the next five years, but something we can all work towards.

Whilst the Cherwell catchment lies largely within Oxfordshire it also encroaches into Buckinghamshire to the east and Warwickshire and Northamptonshire to the north. From its source at Charwelton to the Thames confluence, the river generally flows north to south and over a length of about 96 kms falls 100 metres, draining an area of over 900sq km. The catchment is predominantly clay making it liable to occasional flooding in winter and naturally sluggish flows in summer.

Agriculture is the main land use in the catchment and has influenced the character of its countryside and landscape. The contribution made by the River Cherwell to the character of Oxfordshire in particular is recognised by several policies in the Structure plan which seek to protect and enhance its natural features. Furthermore, human activity has still left significant parts of the catchments' watercourses in a natural or semi-natural state, and the most obvious man-made component is the Oxford Canal which is an important fishery and a substantial recreation resource.

The catchment is not densely populated and development pressures vary throughout the countryside.

The Cherwell above Banbury and most of the tributaries have a good water quality and host a variety of fish species. Riverside flood meadows too, particularly at the lower end of the Cherwell, provide a high conservation value to the area with a number of SSSIs located in this region. The Environmentally Sensitive Area (ESA) designation of the majority of the catchment should go a long way to protect and conserve the wet meadow habitats along the valley.

The catchment is home to 64,000 people who value the Cherwell as an important water resource, and for the quiet pleasure and enjoyment that it brings to their local communities.

Conflicting demands and land use changes proposed for the catchment will need to be addressed within a frame work of community participation, environmental sustainability and a managed but cautious approach where necessary. Our aim is not only to maintain the existing values of the water environment, but also, within the context of the Cherwell environment, to:-

- * raise greater community awareness of their rights and duties as water users in the Cherwell catchment,*
- * seek and gain consensus on decisions affecting the water environment*
- * manage land and water use changes within the boarder framework of imposed political, economic and physical processes*
- * improve both water quality and quantity below Banbury*
- * finalise a waterlevel management plan for Otmoor to address the conflicting needs of land owners, farmers and nature conservation, and*
- * ensure that future development in and around Banbury is sustainable and seeks to attenuate peak flows via source control.*

Establishing strong NRA involvement and links with government bodies, industry and local communities within the catchment is necessary to ensure all views are respected and future development decisions respect this vision for the future well-being of the Cherwell catchment. The NRA therefore welcomes this opportunity to work with all relevant parties to maintain and enhance the water environment.

1 INTRODUCTION

The National Rivers Authority

1.1 The National Rivers Authority (NRA) was established in 1989 as an independent public body with statutory responsibilities for safeguarding and improving the water environment in England and Wales. The Authority is responsible for water resources, pollution control, flood defence, fisheries, recreation, conservation and navigation.

1.2 Within the next three years, the government plans to merge the NRA with Her Majesty's Inspectorate of Pollution and the Waste Regulation Authorities to form the Environment Agency. This new Agency will have wide ranging powers and responsibilities in terms of environmental management (see Appendix A).

1.3 As Guardians of the Water Environment, the NRA has defined its role in the following mission statement:

"The National Rivers Authority will protect and improve the water environment. This will be achieved through effective management of water resources and by substantial reductions in pollution. The Authority aims to provide effective defence for people and property against flooding from rivers and the sea. In discharging its duties it will operate openly and balance the interests of all who benefit from and use rivers, ground waters, estuaries and coastal waters. The Authority will be business like, efficient and caring towards its employees".

1.4 The NRA is committed to preparing a sound and thorough plan for the future management of all river catchments.

1.5 The NRA has placed a particular emphasis on planning for environmental sustainability, through adopting an integrated, multi-functional approach to many of its activities and responsibilities.

Catchment Management Planning

1.6 In order to effectively manage the water environment and sustain it for the future, the NRA has adopted the principle of Catchment Management Planning. This entails the preparation of Catchment Management Plans (CMP) for each natural river catchment within England and Wales. Through data evaluation, issues analysis, external liaison and consultation, the CMP provides a vehicle to focus attention on the water environment. The process involves all interested parties in planning for the future well being of the catchment and establishes an integrated plan of action for managing the catchment over a period of five years, after which the plan is reviewed.

1.7 This Consultation Report has been prepared for the Cherwell Catchment, which lies in the west area of the NRA's Thames Region (NRA-TR). It has been produced at an interim stage of the Catchment Management Planning Process. It describes

the catchment, reviews the state of the water environment and identifies key catchment issues. In addition, a draft catchment vision has been formulated, along with potential strategies and actions for addressing the issues. These will only be finalised once the NRA has completed the consultation process and all responses have been reviewed.

- 1.8 To assist in the preparation of this report, a range of organisations and groups were contacted during August 1994. The results of this period of informal consultation are summarised in Appendix B.

The Consultation Process

- 1.9 The NRA recognises the importance of liaison with interested parties and aims to obtain consensus, both internally and externally, through this consultation report.

- 1.10 The purpose of the consultation phase is to:

- confirm the existing quality of the water environment and the range and extent of catchment uses;
- obtain views on the issues facing the water environment; and
- begin the process of identifying and implementing action plans.

- 1.11 This document is, therefore, part of a process that will enable a shared vision of the catchment to be developed, along with a strategy for its future management. This will guide all NRA activities for the next five to ten years and will hopefully influence the activities of other key bodies. This vision and its supporting strategies will be presented in the 'Final Report' of the CMP, with a series of action plans for the NRA and others to implement. The timetable for completing this report is currently February 1996. Regular monitoring and updating of the plan will be an integral part of the process, ie. an annual progress report and a repeat of the process every five years or so.

- 1.12 The NRA welcomes comments on the document. During the consultation period, comments can be submitted in writing to:

River Cherwell Catchment Management Plan
NRA Thames Region
Isis House
Howbery Park
Wallingford, Oxon OX10 8BD

by

Should you require any information or have any queries on this document, the CMP Project Manager, Jamal A Hamid or Tania Woodward (Catchment Management Officer), can be contacted on (0734) 533304 or 533309, respectively.

2 CATCHMENT DESCRIPTION

INTRODUCTION

2.1 This section provides a general overview of the catchment and describes its natural features under the following headings:

- topography;
- geology and hydrogeology;
- rainfall and river flow;
- strategic and local planning.

Overview of the Catchment

- 2.2 The Cherwell Catchment extends southwards from the headwaters of the river at Charwelton in Northamptonshire to its confluence with the River Thames, at New Hinksey, Oxford. As it drains southwards, tributaries of the Cherwell include the Ashby Brook, the Highfurlong Brook, the Hanwell Brook, the Farthinghoe Stream, the Sor Brook, the Charlton Brook, the River Swere and the Deddington Brook. At Islip, the River Ray system joins the Cherwell and shortly before the Thames confluence, the Bayswater Brook flows into the main river (see Figure 1).
- 2.3 The River Ray is the largest tributary of the Cherwell. It rises near Quainton, flowing 32 km south west to its confluence with the Cherwell. The Longford Brook joins the River Ray just north of Charlton-on-Otmoor.
- 2.4 The Cherwell is a predominantly clay-based catchment, covering an area of 906 km². The River Cherwell shares its valley with the Oxford Canal, constructed in the eighteenth century to form a link between the Coventry Canal and the River Thames, and to provide a means of transporting coal. Jurisdiction on the Oxford Canal over water quality, recreation and fisheries is shared between NRA Thames Region and British Waterways (BW), with navigation and engineering on the canal being the responsibility of BW.
- 2.5 For much of its course, the Oxford Canal shadows the River Cherwell, actually crossing it at Nellbridge and occupying the same channel for the 1.5 km between Enslow and Shipton-on-Cherwell.
- 2.6 Recent river quality surveys indicate water quality in the Cherwell Catchment to be predominantly "fair", with twenty six of the reaches being in this category, fourteen being in the "good" category and six in the "poor" category. The six reaches classified as "poor" are in this category due to sewage or agricultural pollution.
- 2.7 Within the catchment, there are a number of small reservoirs at Wormleighton, Boddington and Clattercote which provide water for the canal. In addition, there is a raw water storage reservoir at Grimsbury, owned by Thames Water Utilities Ltd (TWUL) and used for public water supply.
- 2.8 Key statistics of the catchment are:
- | | |
|-------------------------|---------------------|
| Catchment Area | 906 km ² |
| Population | 63,461 |
| Average Annual Rainfall | 682 mm |
| Total Main River Length | 506 km |
- 2.9 The Cherwell Catchment lies largely within Oxfordshire, although it also encroaches into Buckinghamshire to the east and Warwickshire and Northamptonshire to the north.

River Cherwell Catchment Management Plan

Fig 1. Overview



Scale - Kilometres



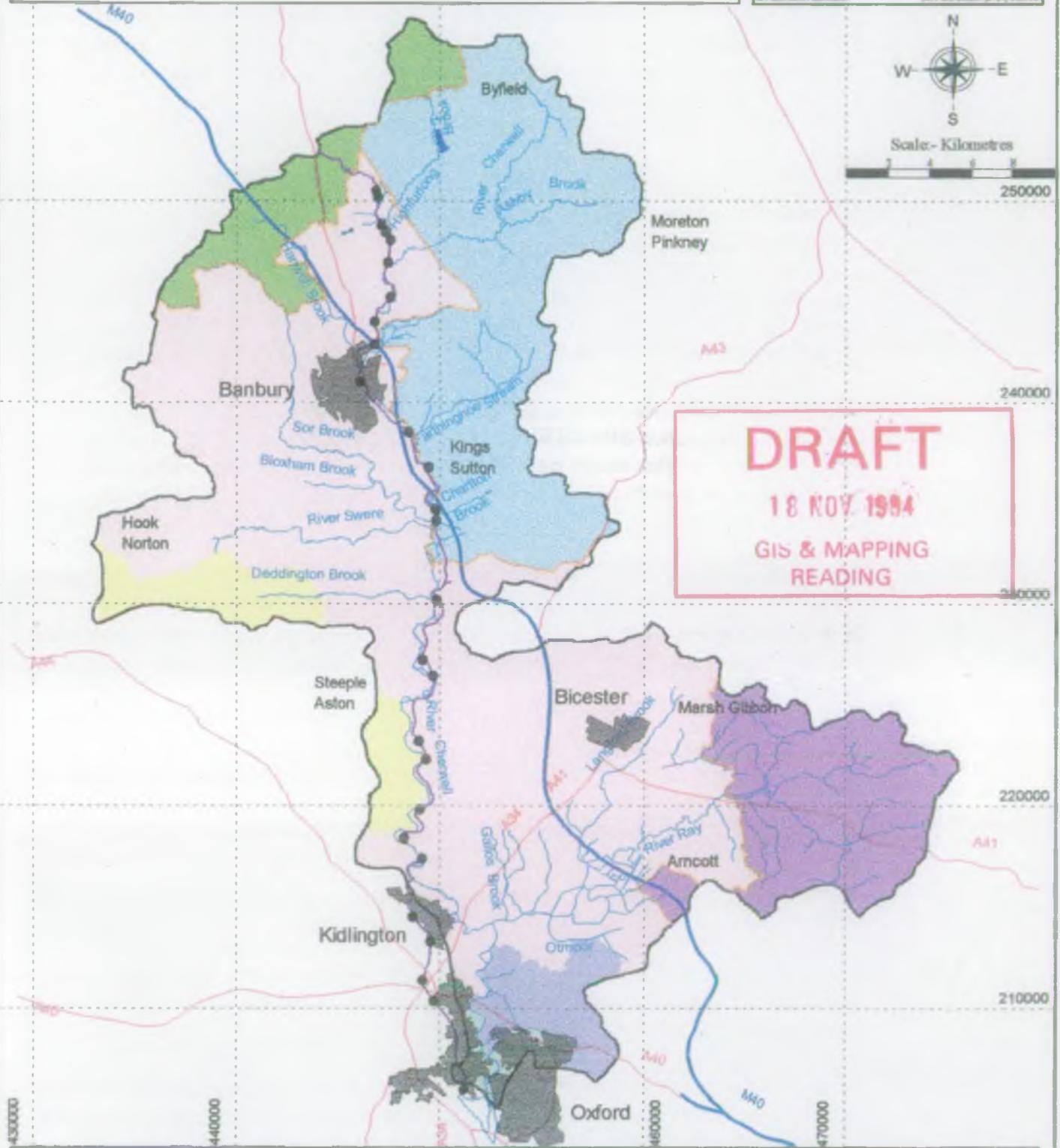
250000

240000

230000

220000

210000



DRAFT
18 NOV 1994
GIS & MAPPING
READING

General Features				Local Authorities					
	CMP Boundary		Urban Areas		County Boundary		Stratford-on-Avon		West Oxfordshire
	Main Rivers		Motorway				Daventry		South Oxfordshire
	Water Body		A Road				S. Northants.		Oxford City
	Oxford Canal		Lock				Cherwell		Aylesbury Vale

- 2.10 The major urban areas in the catchment include Banbury, Bicester, Kidlington and Oxford.
- 2.11 Oxford is under continual pressure for new development and Oxfordshire County Council has promoted a strict green-belt policy, under which it attempts to divert growth to second-tier settlements, such as Kidlington. Development pressures in the catchment have been increased by the opening of the M40, which has made the area more accessible from London and Birmingham.

Topography

- 2.12 The boundary of the catchment includes all land which drains surface water run-off to the River Cherwell. This includes land drained by the Cherwell tributaries.
- 2.13 The Cherwell rises to the south of the Northampton uplands and flows southwards across the Midlands Plateau, a moderately elevated area formed from resistant Jurassic strata, running north east from Banbury, at a height of approximately 100-150 m AOD. The catchment is bounded to the west by the eastern edge of the Cotswold Hills and rises up to a maximum height of 240 m AOD at Whichford Hill Farm (Grid Reference SP330330). The land then falls gently to the Oxford Clay lowlands, with heights rarely rising above 100 m AOD. In places where the clay is exposed at the surface, large areas of poorly drained terrain occur, of which Otmoor is the most notable example (see Figure 2).

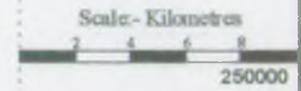
Geology and Hydrogeology

- 2.14 In its general north-south course, the Cherwell traverses the north east to south west trending Jurassic clay and limestone succession, which dips gently south east towards the London Basin.
- 2.15 The headwaters of the catchment commence on the Lower Lias Clay to the north of Banbury. The Lower Lias Clay continues to be exposed in the valley bottom as far south as Souldern Wharf as the river has cut down through the overlying Oolitic Limestones and Middle and Upper Lias Clays. The flow in the Cherwell in this upper part of the catchment is derived mainly from drainage of the clays and from springs which issue from the Marlstone Rock Bed at the base of the Upper Lias Clay.
- 2.16 South of Souldern Wharf, the river flows successively onto the Middle and Upper Lias Clays. The flow is increased by springs issuing from the Inferior Oolite, which is exposed in the valley sides.
- 2.17 Further south, between Northbrook and Thrupp, the river flows over the Inferior Oolite, Great Oolite and Corallian Limestones, with groundwater from these aquifers contributing to the base flow of the river. South of Thrupp, the Cherwell flows onto the Oxford Clay and, after meandering across a widening flood plain with Terrace Gravel deposits overlying the Oxford Clay, the Cherwell joins the Thames at South Oxford. The solid geology of the catchment is detailed in Figure 3.

River Cherwell Catchment Management Plan



Fig 2. Topography



DRAFT
18-NOV-1994
GIS & MAPPING
READING

General Features		Height Above Ordnance Datum (Newlyn)	
	CMP Boundary		180 - 240 Metres
	Urban Areas		120 - 180 Metres
	Main Rivers		60 - 120 Metres
	Oxford Canal		0 - 60 Metres

- 2.18 Groundwater levels depend not on the amount of rain that falls but on the amount that percolates into the ground and, locally, the volume of water abstracted.

Rainfall and River Flow

General

- 2.19 This section considers the main features of the natural water resources within the catchment. Section 3 considers the use of these resources for water supply.
- 2.20 A proportion of the rainfall which falls on the catchment is lost through direct evaporation and transpiration from plants and trees. The remainder is termed the effective rainfall and is the total available water resource to the catchment. This resource may manifest itself as surface run-off to streams and rivers or as recharge to the groundwater aquifer.
- 2.21 The allocation of effective rainfall between surface and groundwater is largely dependent on the nature of the surface geology. Low permeability clay and silt areas result in a high run-off component to a strongly developed surface drainage system. Chalk and some sand catchment areas allow a higher proportion of recharge to groundwater. Consequently, the surface drainage system is less well developed and a large part of the river flow is derived by outflow from the groundwater aquifer. This can occur from springs or through the bed of the river and is known as baseflow.
- 2.22 Surface flows in clay catchments respond rapidly to both high rainfall and drought periods. The water resource available at a river intake shows considerable seasonal variation and these catchments are referred to as 'flashy' in character. The water supply during low flow periods can be enhanced by the construction of reservoirs to store water abstracted during the periods of high flow.
- 2.23 Groundwater aquifers provide a natural storage system for the catchment. Groundwater systems react much more slowly to rainfall and generally provide a more reliable resource during drought periods. Recovery from drought periods may also take longer however. These catchments are considered to be baseflow controlled.

Catchment Perspective

- 2.24 The average annual rainfall in the Cherwell Catchment is 682 mm. This varies from 750 mm in the eastern Cotswolds (around Swerford) to 650 mm in the flatter areas around Oxford (see Figure 4).
- 2.25 A substantial amount of rainfall is lost in evaporation and transpiration. The average annual effective rainfall, after allowing for such losses, is about 210 mm; most of this water becomes run-off into the rivers.

River Cherwell Catchment Management Plan

Fig 3. Solid Geology



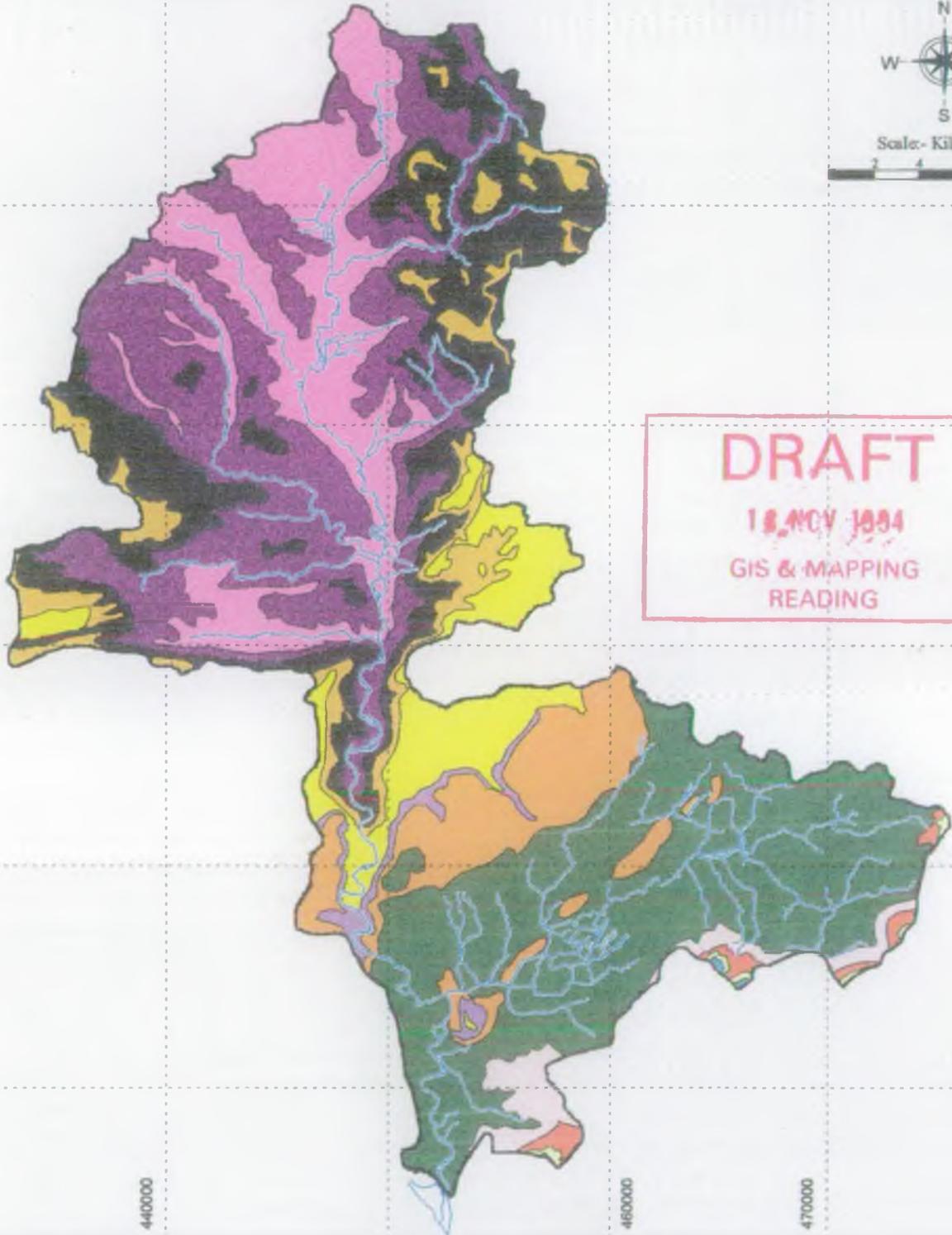
NRA
National Rivers Authority
Thames Region

© Crown Copyright
© Ordnance Survey

BM GIS Section (073-4) 550700



Scale - Kilometres



430000

440000

460000

470000

250000

240000

230000

220000

210000

General Features		Geological Symbols and Colours							
	CMP Boundary		Lower Greensand		Oxford Clay		Inferior Oolite		
	Main Rivers		Portland Beds		Cornbrash		Upper Lias		
			Kimmeridge Clay		Forest Marble		Middle Lias		
			Corallian		Great Oolite		Lower Lias		

- 2.26 Yearly rainfall and yearly percolation data for the catchment since 1961 are shown in Figures 5 and 6.
- 2.27 The majority of the Cherwell Catchment is underlain by clay and so the rivers tend to have little baseflow and respond rapidly to rainfall. Hydrographs for the River Cherwell at Banbury and Enslow, for the period 1982-1994, are shown in Figures 7a and 7b. The naturally low baseflows at Banbury are reduced further by the surface water abstractions at Grimsbury (licensed to abstract 9.96 Ml/d) just upstream of the flow-gauging station. The effluent from Banbury STW is returned downstream of the gauging station and so a section of the river experiences depleted summer flows. The returned effluent from Banbury Sewage Treatment Works is included in the flows measured at Enslow, which therefore has enhanced low flows.

Strategic and Local Planning

General

- 2.28 The NRA is consulted regularly on planning matters falling within its terms of reference, both in the preparation of statutory plans and in connection with individual applications for planning consent. Recent guidance from the Department of the Environment and the Memorandum of Understanding have both strengthened the links between the NRA and the Planning Authorities, but ultimate planning control remains with the Local Authorities.
- 2.29 Catchment Management Plans can be considered as complementary to the Statutory Development Plans of Local Authorities. By stating clearly the NRA vision it is hoped that Catchment Management Plans will make a positive input to the formal planning process, which is the responsibility of the District and County Councils.
- 2.30 In taking decisions regarding particular developments, provisions under the Town and County Planning Act 1990 require that Planning Authorities should have regard to the contents of relevant development plans. Section 54A of the Planning and Compensation Act 1991 specifically states that "*decisions are to be in accordance with the plan, unless material considerations indicate otherwise*". The plan framework required by the 1991 Act requires the preparation in non-metropolitan areas of the following plans:
- (i) **County Structure Plan:** This provides the broad strategic planning framework and should ensure that the provision for development is realistic and consistent with national and regional policy;
 - (ii) **District or Local Plan:** This plan sets out detailed policies and specific proposals for the development and use of land. The local plan should be in general conformity with the Structure Plan;

River Cherwell Catchment Management Plan

Fig 4. Rainfall and River Flow



NRA

National Rivers Authority
Thames Region

© Crown Copyright
© Automobile Association

BAV GIS Section (0734) 535700



Scale - Kilometres



250000



DRAFT

18 NOV 1994

GIS & MAPPING
READING

240000

230000

220000

210000

430000

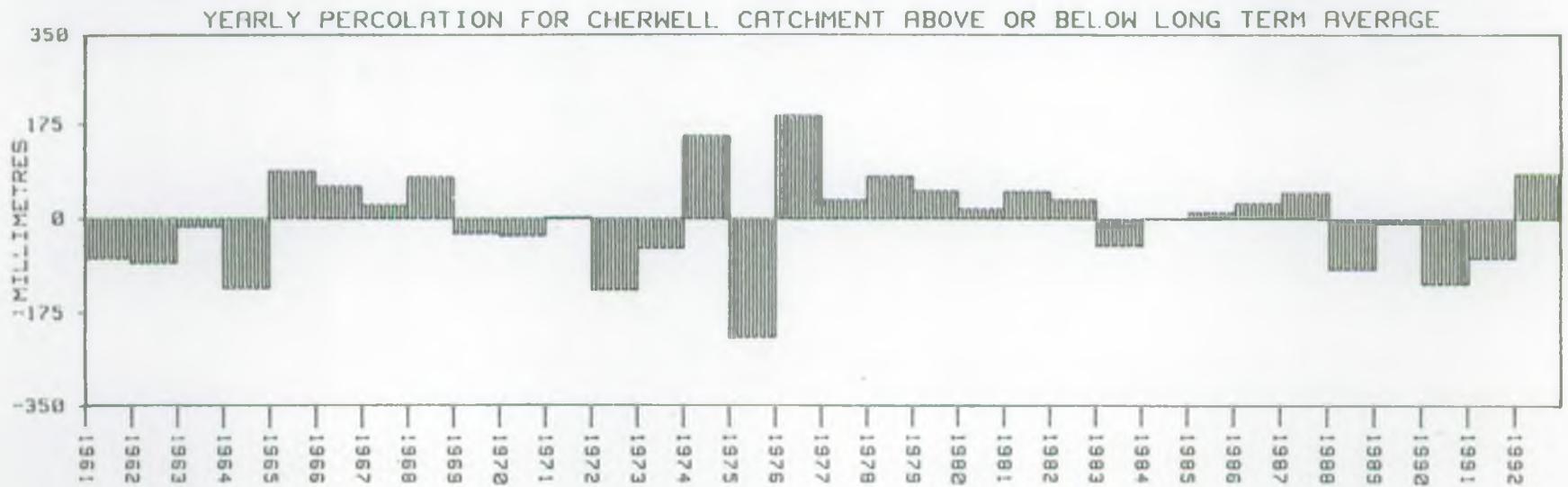
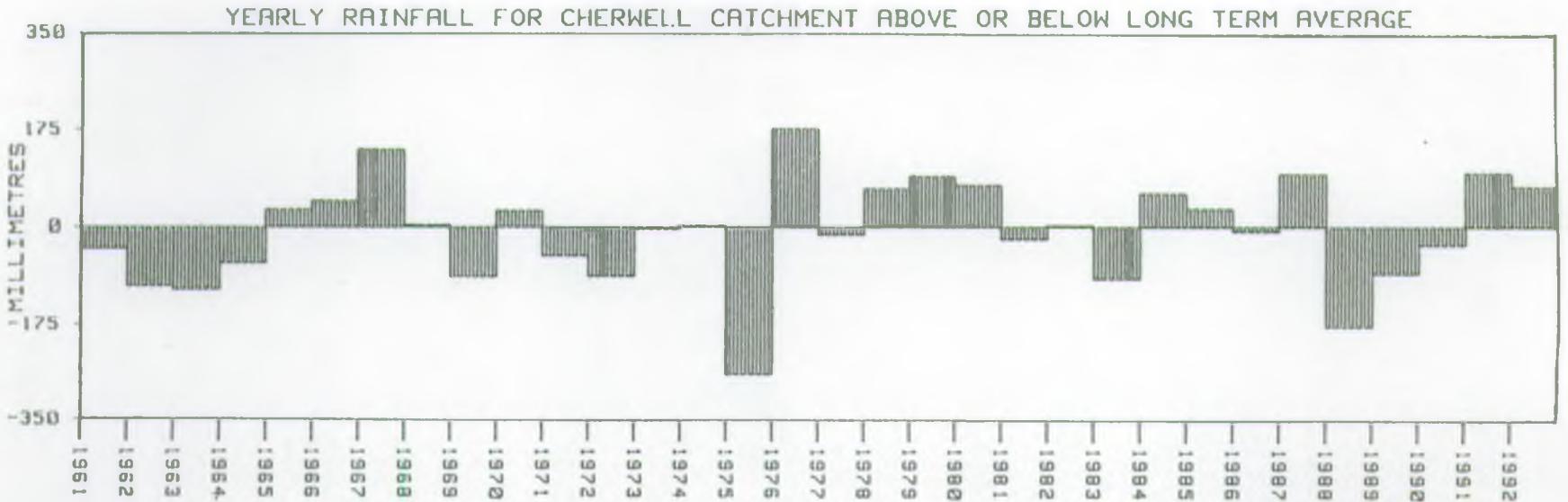
440000

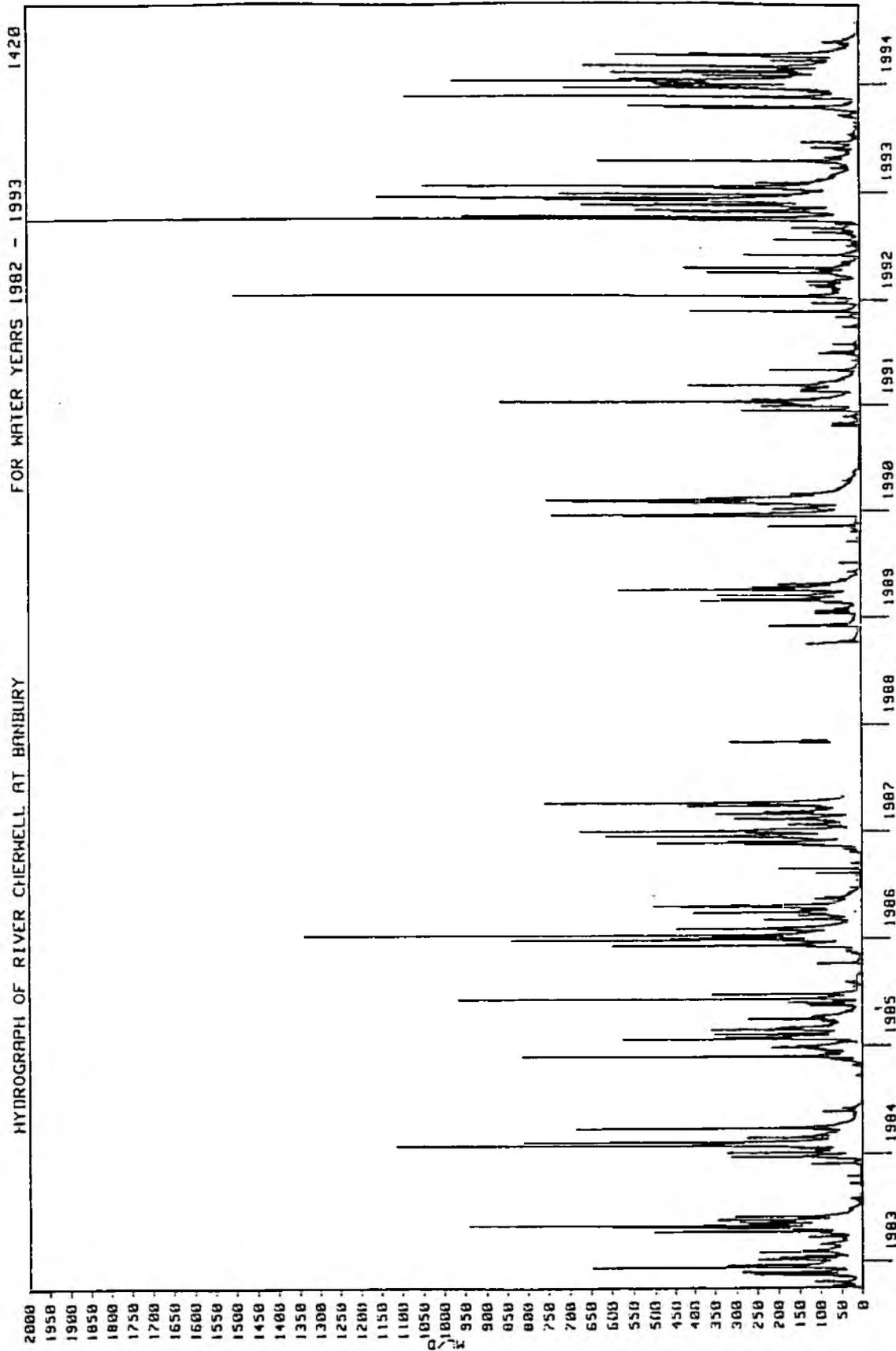
460000

470000

General Features		Rainfall (mm)		Raingauges and Gauging Stations	
	CMP Boundary		600 - <700		Flow Gauging Stations
	Main Rivers		700 - <800		Recording Raingauges
	Urban Areas		800 - <900		Daily Raingauges

Figures 5 & 6: Yearly Rainfall and Yearly Percolation

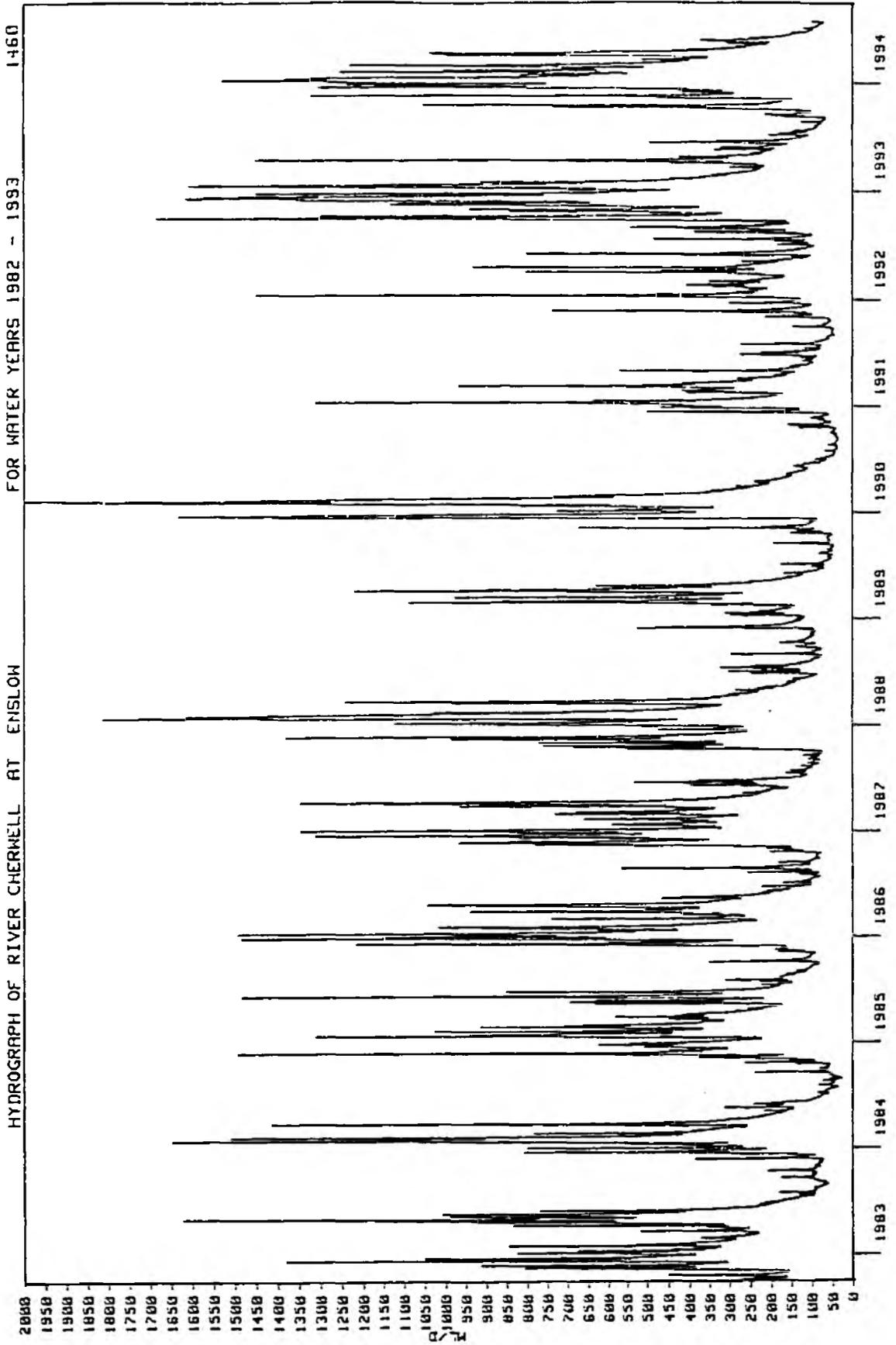




3 Oct 1994

NATIONAL RIVERS AUTHORITY - THAMES REGION

Figure 7a: Hydrograph for the River Cherwell at Banbury



NATIONAL RIVERS AUTHORITY - THAMES REGION

3 Oct 1994

Figure 7b: Hydrograph for the River Cherwell at Enslow

- (iii) **Minerals Local Plan:** Although County Structure Plans will address broad strategies, the Minerals Locals Plan should cover the exploitation of mineral resources in more detail. It should indicate the areas where provision is made for mineral working and the disposal of mineral wastes as well as the areas where mineral resources are to be safeguarded for future working. The plans should also set out development control criteria and requirements for the restoration and aftercare of such sites;
- (iv) **Waste Local Plan:** The Waste Disposal Authority can integrate waste disposal policies into the Minerals Local Plan or prepare a separate Waste Local Plan. The Plan should examine land use implications and identify suitable locations for further facilities.

2.31 Within all the development plans outlined above, proper provision should be made for the needs of the utilities responsible for water supply, sewerage, electricity, gas and telecommunications as well as the National Rivers Authority with all its areas of responsibility. The Town and Country Planning (Development Plan) Regulations 1991 require local authorities to statutorily consult a number of bodies, before putting plans on deposit and, it is at this stage, that authorities will wish to resolve policies and attempt to minimise objections once the plan is on deposit.

Catchment Perspective

2.32 Table 1 below, summarises the distribution of the total catchment area of 906 km² between County Councils and Local Authorities within the catchment boundary.

Table 1: Catchment Area by County and District Council

County Councils		District Councils	
Buckinghamshire	10%	Aylesbury Vale DC	10%
Northamptonshire	22%	Daventry DC	4%
		South Northamptonshire DC	18%
Oxfordshire	62%	Oxford City Council	2%
		South Oxfordshire DC	2%
		West Oxfordshire DC	5%
		Cherwell DC	53%
Warwickshire	6%	Stratford-On-Avon DC	6%
TOTAL	100%	TOTAL	100%

2.33 Most of the local authorities have recently revised, or are currently revising their statutory land use development plans. These documents, when considered in conjunction with Regional Planning Guidance provide the best means of establishing possible future land use trends which have an impact on, or interact with the water environment.

2.34 Regional Planning Guidance Notes for the South East and East Midlands, published by the DoE, aim to secure the best environmental strategy for the catchment and include advice on rivers, water supply and waste water disposal. Consultation with the NRA has enabled views on the extent and location of residential development, mineral extraction, waste disposal and large scale infrastructure schemes to be taken into account. These views should be reflected in future structure plans.

2.35 Particular provisions which may affect this CMP include:

Regional Planning Guidance for the East Midlands: (13.5) "*Planning Authorities should have regard to these [Catchment] Management Plans when formulating development plan policy*";

(13.6) "*Local authorities should aim to reconcile all the competing uses in the major river valleys in the East Midlands and include appropriate policies in their development plans. Within these policies, development plans should also identify areas where development should not be permitted because of the risk of flooding.*";

Regional Planning Guidance for the South East: (1.10) "*All development should be planned in ways which work towards securing the objectives of sustainable development..... Development should respect the Region's valuable environmental features*";

(4.25) "*Local authorities are encouraged to provide and support initiatives which seek to conserve, restore or enhance the natural elements of river valleys and the water environment.*";

(4.26) "*Flooding may be an issue on the floodplains of major rivers, such as the River Thames, or at the confluence of rivers. Local authorities should, in consultation with the NRA, take land instability and flooding into account in the planning process and should resist inappropriate development, including raising land within floodplains where such development would be at risk from flooding or may cause flooding elsewhere. PPG 14 "Development on Unstable Land" and Circular 30/92 "Development and Flood Risk", give advice on these matters.*"

2.36 NRA involvement with and representations on development plans and other planning documents has raised awareness of the need to conserve and enhance the water environment. It is hoped that these representations and the subsequent inclusion of NRA interests in development plans will help to firmly establish CMPs in the development planning process.

2.37 The following development plans are relevant to the study area:

- **Structure plans:**

Oxfordshire 2001, February 1992;

The New Buckinghamshire County Structure Plan 1991-2011, Deposit Draft, April 1994;

Northamptonshire County Structure Plan, Alteration No 1, January 1992;
Warwickshire Structure Plan 1989-2001, September 1991.

- **Local Plans:**

Oxfordshire:

Oxford Local Plan Review 1991-2001, Deposit Draft, June 1993;
Cherwell Local Plan, Deposit Draft, November 1992;
South Oxfordshire Local Plan, Deposit Draft, December 1993;
West Oxfordshire Local Plan, Deposit Draft, October 1993;
Oxfordshire Minerals and Waste Local Plan, Deposit Draft, 1993.

Buckinghamshire:

Aylesbury Vale (Rural Areas) Local Plan, Adoption Draft, December 1991;
Buckinghamshire Replacement Minerals Local Plan, Draft, June 1990 and
Proposed Modifications, June 1993;
Buckinghamshire Waste Management Plan and Supplementary Document,
January 1993;

Northamptonshire

Daventry District Local Plan, Deposit Draft, August 1993;
South Northamptonshire Local Plan, Deposit Draft, November 1993;
Northamptonshire Minerals Local Plan 1991-2006, Deposit Draft, March
1993.

Warwickshire

Stratford-On-Avon District Local Plan, Deposit Draft, January 1993;
Warwickshire Minerals Local Plan, Deposit Draft, May 1992

- 2.38 Other strategies relevant to the water environment include the Tourism Action Plan 1994/95 (South Northamptonshire Council 1994).
- 2.39 The DoE Circular 30/92 on Development and Flood Risk, published in December 1992, requires the NRA to provide Local Authorities with data on flood risk areas. In March 1994, the NRA joined with representatives of Local Planning Authorities across England and Wales to sign a Memorandum of Understanding on development and flood risk. The memorandum sets out how the NRA will embark on a large data collection and modelling exercise in order to supply Local Authorities with information on flood risk areas.
- 2.40 This new agreement will help to ensure that planning decisions take account of any risk of flooding.

- 2.41 The survey work which underpins the agreement will be carried out under Section 105 of the Water Resources Act (1991).
- 2.42 In September 1994, the NRA published a consultation report: "Thames 21 - A Planning Perspective and Sustainable Strategy for Thames Region", which identifies key planning and development issues within the region in terms of both current and likely future development pressures and discusses how these relate to the NRAs activities.

3 CATCHMENT USES AND RESOURCES

INTRODUCTION

3.1 This section describes current and future uses of the water environment within the catchment. For each of the catchment uses, the following information is provided:

- **General** - this provides an overview of catchment uses, at a national level;
- **Catchment Perspective** - this describes how the use manifests itself within the catchment and details both current and future activities;
- **Environmental Objectives** - this suggests broad-based NRA objectives for the conservation and enhancement of the use and/or the water environment.

Maps are used to enhance the information in the text and highlight the physical context of the use.

NATURE CONSERVATION

General

- 3.2 This use relates to the protection of the aquatic flora and fauna and ecology of the river corridor. This includes organisms which are dependent upon the river itself, and plants and animals which are able to exploit the river banks. A healthy river and adjacent corridor environment are characterised by ecologically diverse and abundant plant and animal communities which enhance the overall quality of the landscape.
- 3.3 The character of the river and its corridor is highly dependent on the adjacent land use and the type and frequency of river works undertaken. Rivers have been managed and used by man for thousands of years. The creation of water meadows and wet pasture, pollarded willows, and mills, all add to the diversity and quality of the environment, both ecologically and visually. However, more recent measures like realignment, removal of bankside trees and draining of wetlands have significantly altered parts of this environment. Modern farming has often led to the removal of riverside vegetation and utilisation of the land up to the banks of the watercourse. This practice effectively removes beneficial shading and cover from the river and can often result in increased soil erosion and siltation of the river bed.
- 3.4 The NRA's conservation duties are set out in Section 16 and 17 of the Water Act 1991, and require the NRA, whilst carrying out its own functions or dealing with proposals by others, to further the conservation of flora, fauna, geological and physiographical features of special interest, and the enhancement of natural beauty. Consideration of the impact of all proposals is also required to encompass the impacts on the man made environment including buildings, and sites and objects of architectural or historic interest.
- 3.5 Many other statutory and voluntary bodies have roles and responsibilities regarding conservation. English Nature is the official body primarily responsible for nature conservation and has the functions of establishing, maintaining and managing National Nature Reserves (NNRs), advising the Government, providing general information and advice, giving grants and supporting research. English Nature is also required to notify Sites of Special Scientific Interest (SSSIs) which are protected by the Wildlife and Countryside Act 1981. Country Trusts for Nature Conservation (or Wildlife trusts) look after County Trust Reserves (CTRs), Local Nature Reserves (LNRs) and Sites of Nature Conservation Interest (SNCIs). The Royal Society for the Protection of Birds also plays an important part in protecting wildlife and has established many reserves.

- 3.6 The Countryside Commission is responsible for conserving and enhancing the natural beauty and amenity of the countryside. It is empowered to designate, for confirmation by the Secretary of State for the Environment, National Parks and Areas of Outstanding Natural Beauty (AONBs). The Commission operate the Countryside Stewardship Scheme which offers grants to landowners for the preservation and re-creation of natural landscapes and wildlife habitats, including waterside areas.
- 3.7 The Commission also advise the Government on the Environmentally Sensitive Area programme which has similar aims and is managed by the Ministry of Agriculture, Fisheries and Food.
- 3.8 Lists of buildings of special architectural or historical interest are compiled by the Secretary of State for the Environment. English Heritage is responsible of protecting and conserving the architectural and archaeological heritage through managing Ancient Monuments and providing advice and information. Local planning authorities can also designate for special protection 'conservation area' of particular interest.
- 3.9 The National Trust, an independent charity, owns and protects a variety of properties and areas of natural beauty and/or interest and makes these open to the public.

Catchment Perspective

Current Use

- 3.10 There are twelve SSSIs located adjacent to watercourses within the Cherwell catchment. These are detailed in Table 2. A number of these sites upstream of Kidlington are important flood meadows of considerable floral and ornithological interest with Snipe, Curlew, Lapwing and Redshank breeding in these areas. There are also valuable waterside meadows along the River Ray.
- 3.11 In March 1994, the Upper Thames Tributaries were designated by MAFF as an Environmentally Sensitive Area (ESA). The designation follows the valleys of the Rivers Ray and Cherwell and also covers Otmoor as shown in Figure 8. The ESA was designated in part to protect the wet meadow habitat along the valleys. Otmoor is a particularly valuable area and relies heavily on winter flooding to maintain water levels and safeguard the conservation interest of the site.
- 3.12 New automatic sluice gates have been installed on the River Ray near Grange Farm, and several farmers along the valley have entered into Countryside Stewardship Schemes, with the aim of keeping water levels high and preserving wetland habitats, particularly at Otmoor. This has, however, met with some opposition from farmers wishing to grow arable crops and some areas of Otmoor are still pump drained.

Table 2: SSSIs Within the River Corridor

Site	Area (ha)	Main River	Habitat
Arcott Bridge Meadows	8.7	River Ray	Marginal and inundation, and neutral grassland
Bestmoor	12.4	River Cherwell Deddington Brook	Neutral grassland
Finmere Wood	45.7	River Ray	Woodland
Grendon and Doddershall Woods	67.1	River Ray	Woodland
Long Herdon Meadow	4.5	Grange Farm Ditch, River Ray	Grassland
Murcott Meadows	22.8	Panshill Brook	Grassland
New Marston Meadows	44.2	River Cherwell, Marston Brook	Hedge, swamp, grassland
Otmoor	211.6	Beckley Brook, Otmoor Inner, Circle Dike	Marsh and grassland
Rushbeds Wood and Railway Cutting	80.2	Ludgershall Ditch	Scrub, woods and grassland
Trafford House	18.6	River Cherwell, Ashby Brook	Other habitat
Wendlebury Meads	73.2	Langford Brook	Hedge
Whitecross Green and Oriel Woods	64.1	Panshill Brook	Marsh and marshy, grassland

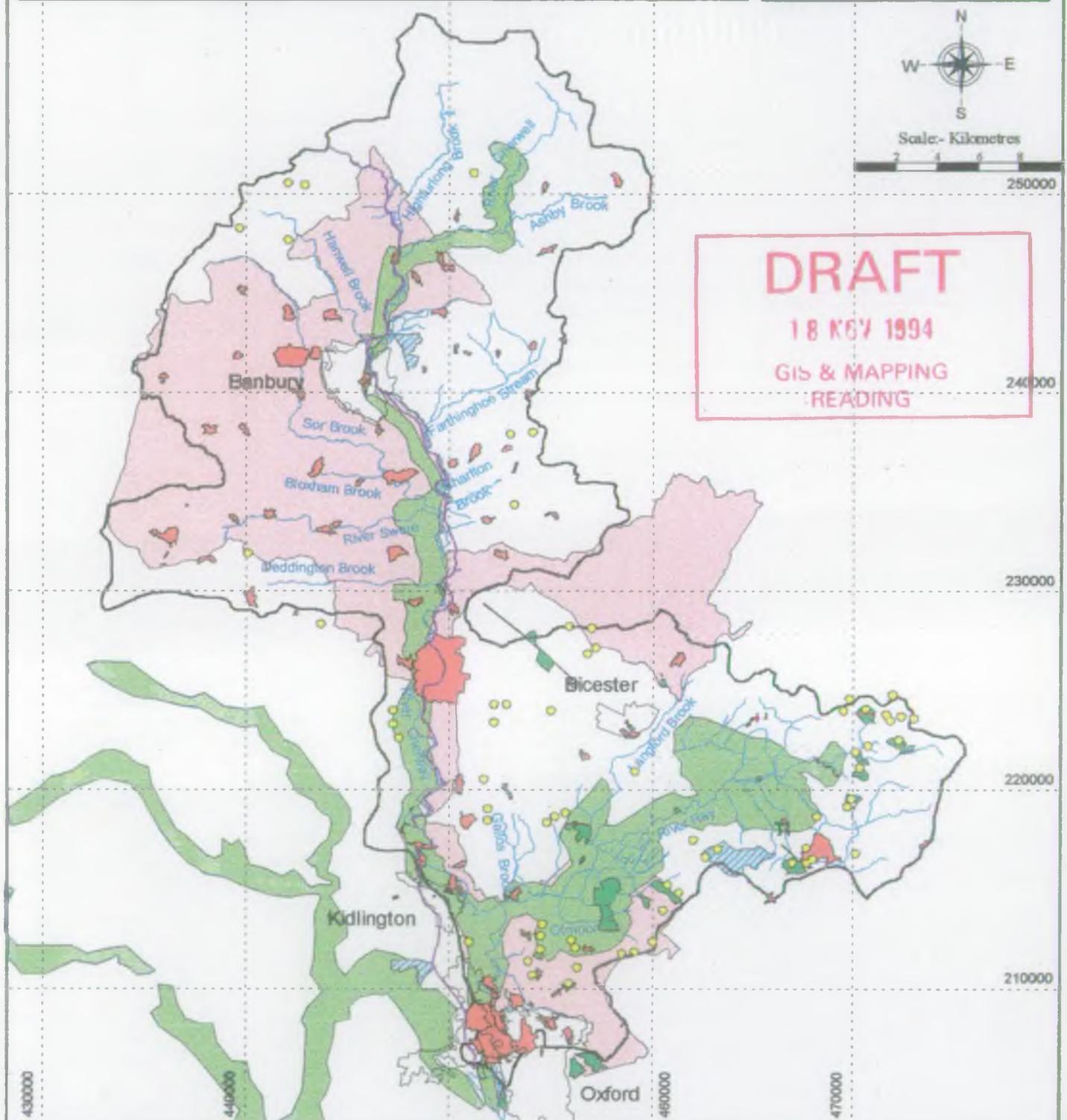
- 3.13 The Oxford Canal is important nationally for its population of water voles. Dragonflies are also of importance around the canal.

Future uses

- 3.14 An otter habitat project is currently underway in the Upper Thames Catchment. This scheme was initiated by NRA-TR and is co-funded by the NRA and British Telecom. The project is run by the Bucks, Berks and Oxon Naturalist Trust (BBONT), in conjunction with the Gloucestershire Wildlife Trust and the NRA. The scheme, which commenced in 1992, seeks to enhance and improve aquatic and riparian habitats to benefit all wildlife and especially to encourage wild otters (which had become extinct in Oxfordshire in the 1970s) to recolonise the region naturally. This project will continue during 1994/95.

River Cherwell Catchment Management Plan

Fig 8. Nature Conservation



DRAFT
18 NOV 1994
GIS & MAPPING
READING



Scale - Kilometres



250000

240000

230000

220000

210000

430000

440000

460000

470000

General Features		Conservation Features	
	CMP Boundary		SSSI
	Main Rivers		Area of High Landscape Value
	Oxford Canal		Conservation Area
	Urban Areas		Environmentally Sensitive Area
			Local Nature Reserve
			Ancient Woodland

- 3.15 Once the Upper Thames Otter Habitat Project is completed, a similar project may be undertaken in the Cherwell catchment, to assess its suitability for use by otters. The project would also assess the general conservation value of the catchment, the otter providing what could be considered the ultimate indicator of aquatic and marginal ecological quality. This will, however, be subject to sufficient funding being secured.
- 3.16 There is a need to include the identification of floodplain habitats as part of Phase II Habitat Surveys undertaken within the catchment.

Environmental Objectives

- To safeguard and enhance the special ecological interest for which sites have been designated, eg. SSSI;
- To promote the conservation of all aquatic life and associated non-aquatic organisms in the river corridor, and to protect the integrity of all habitats of nature conservation value;
- To carry out channel and riparian enhancement schemes on currently degraded reaches and river corridors.

LANDSCAPE

General

- 3.17 The landscape of an area reflects the complex interplay between the natural environment and man's activities. Geomorphology, geology, topography and drainage provide the basic elements of the landscape, and together with associated vegetation and settlement patterns determine the essential landscape character of an area.

Catchment Perspective

Current Use

- 3.18 The Cherwell floodplain along much of the valley is an attractive area characterised by water meadows, areas of agricultural land and large open fields.
- 3.19 The Cotswold Hills (to the west of the catchment) are considered to be a high quality landscape, characterised by open wolds, dry stone walls, ancient woodlands, attractive river valleys and historic towns and villages. The Oolitic limestone of the Cotswolds supports unimproved grasslands and beech woods of high nature conservation value.
- 3.20 The high quality and variety of the Cotswold landscape have been recognised by its designation as an Area of Outstanding Natural Beauty (AONB) (see Figure 9).
- 3.21 In addition to the river valleys and the Cotswold vernacular, there are a variety of other landscape characteristics within the catchment. Otmoor, the 'ironstone' country of the parishes bordering Cherwell District, the open limestone hills and hilltop settlements around Brill, the Cotswold scarp slopes and other areas of special landscape quality have been designated at county level as either Areas of Attractive Landscape, Areas of Great Landscape Value or Special Landscape Areas. These designations highlight the distinctive quality of the landscape and all relevant local authorities exercise special control over development within these areas of catchment.

Future Use

- 3.22 The particular value and sensitivity of the river and water environment within urban and rural areas of the catchment has only been partially evaluated through general surveys of the landscape, (eg. Warwickshire County Council and Countryside Commission studies of the Warwickshire landscape). Landscape Assessments have not as yet been undertaken by the NRA for the Cherwell Catchment as a whole and this could be identified as a future point of focus.
- 3.23 Development within these landscape areas is carefully controlled by the local authorities.

3.24 Countryside Stewardship schemes operating within the catchment could also affect the appearance of the landscape in the future, as one of the objectives of the scheme is to improve degraded landscapes and increase their wildlife value.

Environmental Objectives

- To safeguard the special landscape interest of designated sites including the Cotswold AONB;
- To protect and conserve highly valued river landscapes and enhance degraded river landscapes;
- To carry out a Landscape Assessment of the Cherwell Catchment according to NRA methodology.

River Cherwell Catchment Management Plan (Landscape and Heritage?) Fig 9. Planning Policy - Conservation



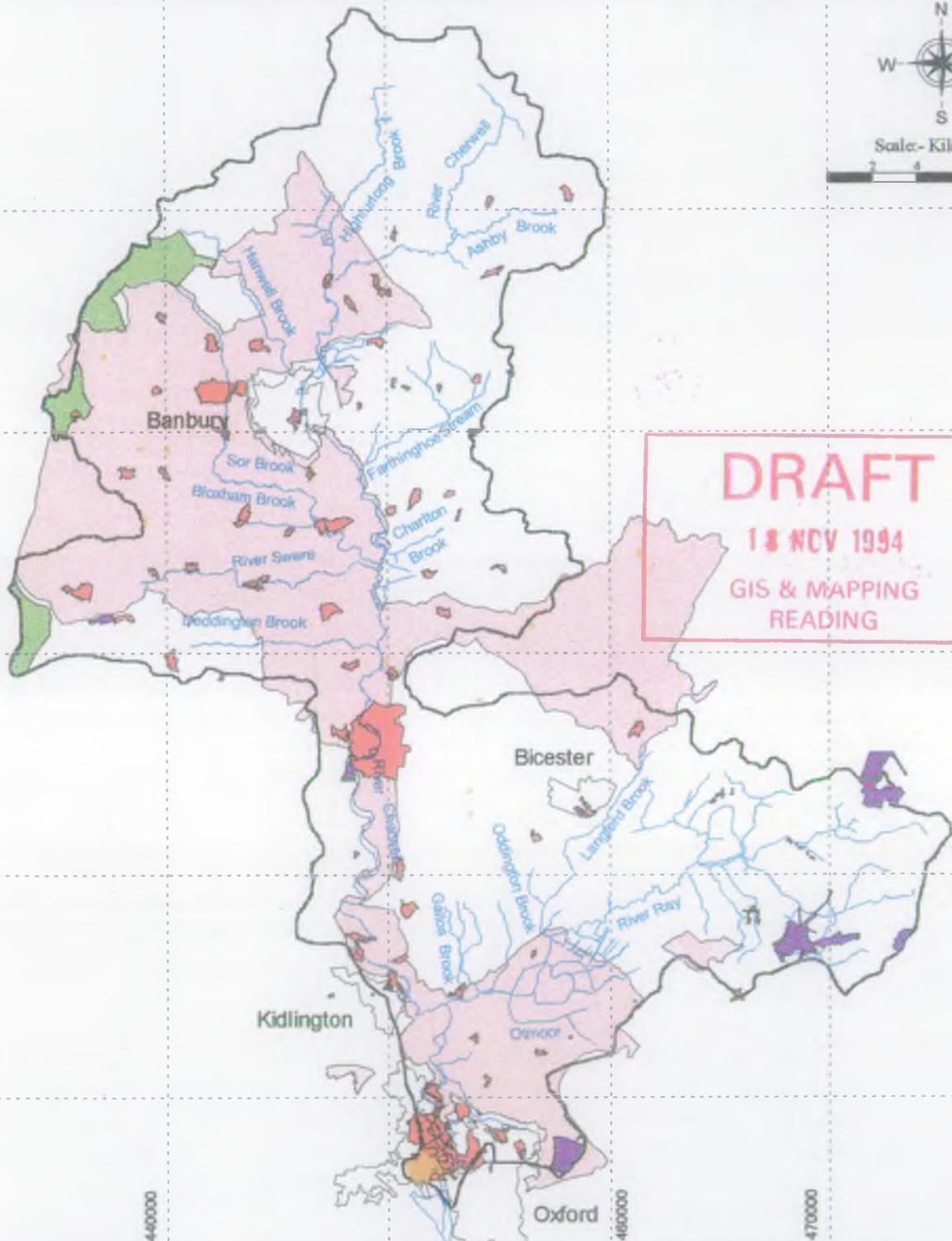
NRA
National Rivers Authority
Thames Region

© Crown Copyright
© Automobile Association

BJW GIS Section [734] 535760



Scale - Kilometres



DRAFT
18 NOV 1994
GIS & MAPPING
READING

General Features		Landscape Designations		Conservation Features	
	CMP Boundary		AONB		Designated Conservation Area
	Urban Areas		Green Belt		Scheduled Ancient Monument
	Main Rivers		Area of High Landscape Value		Listed Gardens
					Archaeological Area

HERITAGE

General

- 3.25 This use relates to sites or areas which are deemed to be of historical or archaeological importance. Archaeological and heritage resources include, not only obvious and well-known sites such as stone circles, castles and historical industrial buildings, but also the below ground remains of rural and urban settlements and other activities, many of which left no surface trace.
- 3.26 Under the 1989 Water Resources Act, the NRA has a duty to protect and conserve buildings, sites and other objects of archaeological, architectural or historic interest.

Catchment Perspective

Current Use

- 3.27 Development in the catchment can be traced back to early Saxon times with the establishment of a settlement on the Cherwell, which later became known as Banbury. Corn and tweed mills were built on the river, namely at Twyford and Grimsbury, and the landscape has been characterised by early farming activity. The land around the Cherwell was also farmed in the Iron Age and ancient tracks, such as Banbury Lane, the ancient fords at Twyford and Grimsbury and evidence of "Roman Banburyshire", such as Akeman Street and the A421 at Bicester, all indicate early activity and settlement in the area.
- 3.28 Archaeological and other historical remains are abundant throughout the catchment and features such as the Alchester Roman site at Wendlebury and Deddington Castle have been nationally scheduled as ancient monuments. Figure 9 details the location of Scheduled Ancient Monuments within the catchment. Other important sites are recorded in the Sites and Monuments Record maintained by each County Council.
- 3.29 The Cherwell Valley also carried important links between the South and the Midlands including early roads, the Oxford Canal built in 1778 and the railway, which was constructed in 1850, all of which have significant effects on the character of the valley landscape within the catchment.
- 3.30 Buildings of special historic or architectural importance within the catchment have been listed by the Secretary of State for National Heritage. About ten historic parks and gardens, including Rousham Park in the Cherwell Valley, Wotton House and Aynho Park, are listed in the English Heritage Register of Parks and Gardens of Special Historic Interest. Wykeham Park and other sites have also been identified as being of local interest.
- 3.31 The collective character of many towns and villages within the catchment has been recognised by the local authorities, and several are designated conservation areas.

Future Use

- 3.32 The NRA recognises the contribution made to the environment by features of historic interest and in the course of its duties seeks to protect ancient monuments, listed buildings and archaeological features. Future activity within the river corridors in the catchment, should be sensitive to the archaeological and heritage interests of the area.

Environmental Objectives

- To protect and conserve the archaeological and heritage interest of archaeological sites within the river corridor.

AMENITY AND RECREATION

General

- 3.33 This use relates to those activities which attract people to the river corridor. Activities include walking, canoeing, swimming, boating and bird watching. The principal areas of concern are general aesthetic acceptability, access to the watercourse and, in the case of immersion sports, the health risk.
- 3.34 The Amenity and Recreation duties of the NRA are set out in Section 8 of the Water Act 1989, which generally empowers the NRA to conserve and enhance the natural beauty and amenity of inland and coastal waters and associated land, as well as promote the use of such waters and land for recreational purposes. The NRA is also required to have regard to the desirability of preserving public freedom of access and to take into account, either as a matter of its own activities or those of others, the likely effect specific action would have on any such freedom of access. The NRA may also actively promote proposals for amenity and recreational development where it is considered desirable.

Catchment Perspective

Current Use

- 3.35 The catchment is of value for both informal countryside recreation and leisure and for organised sports activities. There is an extensive network of rights of way, including a number of long distance paths, such as the Oxfordshire Way and the Jurassic Way (see Figure 10).
- 3.36 The River Cherwell and River Ray, along with the Oxford Canal, are used for a range of recreational activities including boating, punting, canoeing, angling and walking. The lakes at Adderbury and Grimsbury in the Spiceball Country Park are also popular for walking, sailing and fishing.
- 3.37 The Oxford Canal is a major attraction for boat users and is the second most popular stretch of canal in the country, with 6-8,000 boats per year passing through the Banbury area.
- 3.38 The Lower Cherwell at Oxford is used for punting, with a punting station below Magdalen Bridge. Marshall School also has punts below the bridge. Oxford City Council have recently carried out a safety review of equipment used on the punts throughout Oxford.
- 3.39 The River Cherwell and River Ray are used for canoeing.
- 3.40 The Cherwell is a heavily fished river, with angling clubs leasing water on most reaches from Cropredy to the Thames confluence. Large matches are regularly held on the river. The exception to this general rule is the reach between Banbury and Nellbridge, where anglers regard stock levels too low to warrant attention.

Future Use

- 3.41 Oxford City Council are considering the potential to develop the recreational, leisure and tourist opportunities of the Oxford Canal, in conjunction with British Waterways. The provision of waymarkers, interpretive material and other facilities could be included in the proposals.
- 3.42 South Northamptonshire District Council's Tourism Action Plan proposes improvements along the canal network, including the provision of moorings and boat bases, but proposals for new boating facilities should not be detrimental to the amenity and environmental quality of the area.
- 3.43 Cherwell District Council have recently commissioned a study by Parkin Heritage and Tourism Consultants to assess recreation and leisure opportunities at suitable sites within the District Council boundary, with particular emphasis on the use of river corridors.
- 3.44 Cherwell District Council are encouraging the restoration and use of the Shipton-On-Cherwell quarry for outdoor recreation. Although the site is within the green belt, water pursuits, camping and caravanning could be considered appropriate. All the relevant local authorities support the sensitive re-use of former mineral extraction and waste disposal sites for water based recreation. As a result, the quarry has been identified by the NRA as a potential site for an area specific survey, offering potential for environmental enhancements.
- 3.45 Cherwell District Council also seek to enhance the recreation roles of the Oxford Canal and River Cherwell and is promoting the creation of a long distance footpath between Oxford and Coventry, based on the canal towpath. The "Waterways Trail" would link other existing rights-of-way and provide a long distance path to link the Grand Union Canal walk to the Thames Path. The towpath has already been combined with other footpaths to make a variety of circular walks. The Council has also identified the opportunity to create a linear park for informal recreation within the Cherwell Valley based on the Oxford Canal and River Cherwell corridor.
- 3.46 Cherwell District Council is proposing to allocate land on the eastern side of Bicester Airfield for the creation of a country park and outdoor water sports. Potentially, the country park could be extended to incorporate Stratton Audley quarry, once mineral extraction has ceased.

Environmental Objectives

- To maintain and enhance water quality for the provision of water-based recreation;

- To protect and promote all suitable water-related recreational uses;
- To maintain or improve water quality, river flow and channel characteristics, in order to prevent public nuisance arising from visual and smell problems.

River Cherwell Catchment Management Plan

Fig 10. Amenity & Recreation



NRA

National Rivers Authority
Thames Region

© Crown Copyright
© Automobile Association

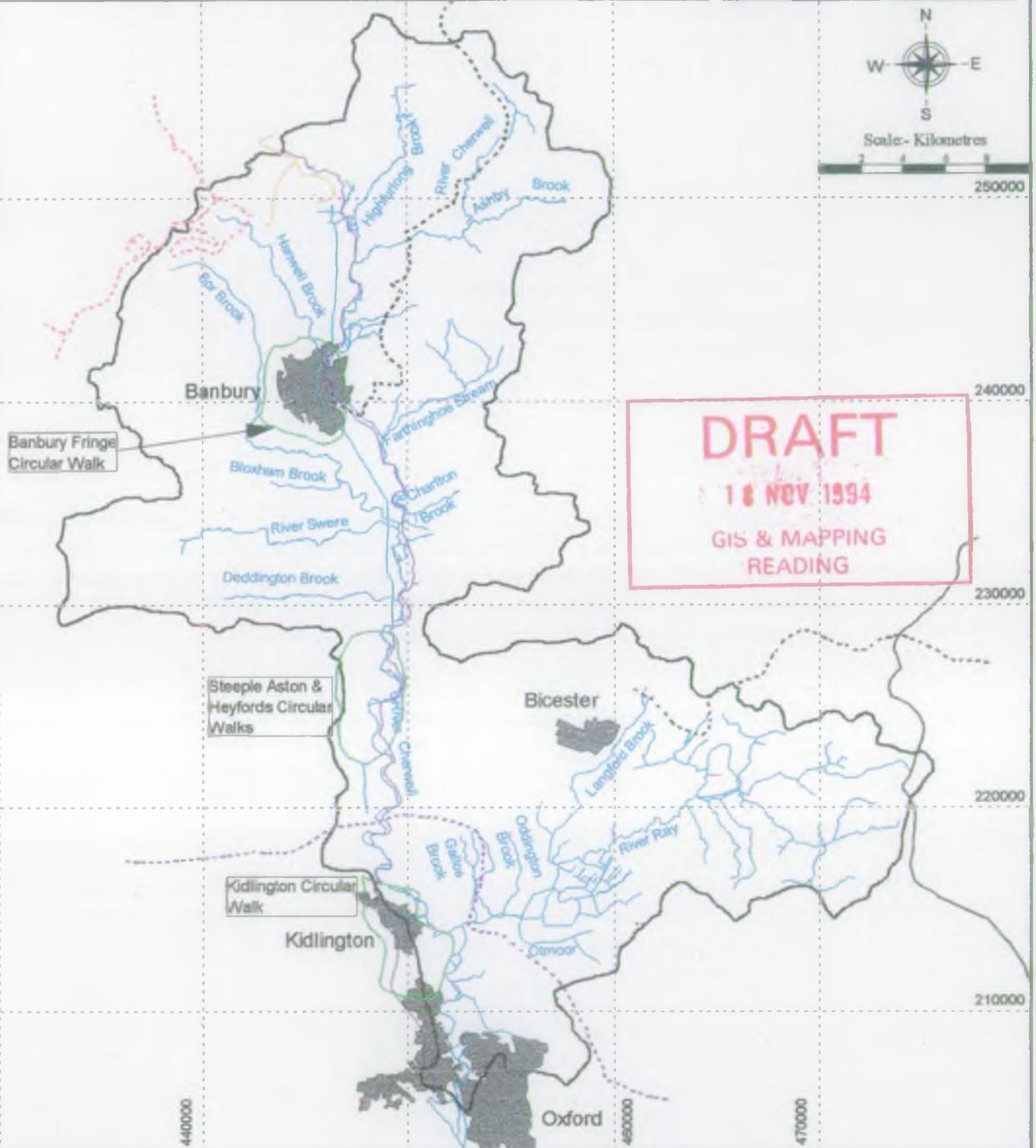
BM 93 (Scale 1:750 000)



Scale: - Kilometres



250000



DRAFT
18 NOV 1994
GIS & MAPPING
READING

General Features		Footpaths			
	CMP Boundary		Jurassic Way		Oxfordshire Way
	Urban Areas		d'Arcy Dalton Way		North Bucks. Way
	Main Rivers		Centenary Way		Cross Bucks. Way
	Oxford Canal		Oxford Canal Linear Path		Circular Walks

FISHERIES

General

- 3.47 This use relates to the maintenance and improvement of breeding populations of coarse and game fish and the use of the river by anglers. Game fish (also referred to as Salmonids) and coarse fish (Cyprinids) are protected under the EC Fisheries Directive (78/659/EEC), which sets water quality criteria to protect fish life in designated freshwater reaches. Additional reaches may be designated periodically or existing reaches upgraded.
- 3.48 Fish are sensitive to water quality and habitat conditions available within the river ecosystem. They are distributed in a catchment according to geographical parameters, principally bed gradient and river flow, but modified by the quality of the water, which relates to the inputs of pollutants and nutrients. They are, therefore, important not just for their own presence but also as an indicator of the overall health of the river.

Catchment Perspective

Current Use

- 3.49 The Cherwell Catchment is predominantly a coarse fishery with the River Cherwell itself supporting a variety of fish species. Upstream of Banbury, the fish population is dominated by roach, dace and trout. Carp and barbel are also present. In addition, the Cherwell is renowned for its specimen chub and barbel, with individual fish reaching 2.3 kg (5 lb) and 4.5 kg (10 lb) respectively.
- 3.50 The NRA undertakes surveys of the fisheries every five years. These surveys collate data on habitat, biomass (the weight of fish per square metre of water surface) and also collect information on factors such as flows and water quality (see Figure 11).

Future Use

- 3.51 There is potential for multi-functional collaboration on schemes promoting the sympathetic management of riverside meadows, particularly along the River Ray, to promote habitat restoration, increase water retention in the catchment and enhance fisheries.
- 3.52 Future fisheries surveys are scheduled for the River Cherwell (1994/95), the River Ray (1996/97) and the Oxford Canal (1997/98).

Environmental Objectives

- To work towards the production of a diverse and sustainable fish population within the catchment;
- To identify and address physical, chemical and biological factors preventing the achievement of the above;
- To safeguard and maintain the water quality of all designated cyprinid fisheries.

NAVIGATION

General

- 3.53 This use relates to those waterways for which there is a statutory right-of-passage for boat traffic.
- 3.54 Generally, there is no right-of-navigation over non-tidal stretches of water, unless one has been established through historical usage, by dedication from the riparian owner, or by statute. The extent of freshwater rights is not as substantial as that existing on tidal reaches of rivers. For instance, there may be restrictions on the parts of rivers over which navigation can be exercised or on the type of craft. Generally, there is no right-of-landing, except by custom or grant, since the banks on non-tidal rivers are owned by individuals, rather than the Crown.

Catchment Perspective

Current Use

- 3.55 Legislation enables the NRA to act as the Navigation Authority for moribund navigation on the Cherwell. However, there is no navigation *per se* on the river. The only interface that exists is that any craft entering the River Thames from the Cherwell are required to be registered and conform to NRA licensing requirements. Navigation on the Oxford Canal is controlled by British Waterways; the NRA has no responsibility for controlling navigation on the canal (see Figure 12)..

Future Use

- 3.56 The availability of moorings along the canal is a problem, particularly in the Oxford area. Three temporary mooring sites have been secured in Oxford. However, BW are still seeking opportunities to create permanent off-line moorings.

Environmental Objectives

- 3.57 • To maintain or improve water resources and physical characteristics in the catchment in conjunction with BW to sustain the Oxford Canal.

WATER ABSTRACTION

General

- 3.58 Abstraction is the removal of water from rivers or groundwater. Abstractions can vary in quantity from the very small amounts needed from a garden well to supply a single household, to the large quantities needed from a river to flow through a fish farm. Water is abstracted to satisfy the needs of agriculture, industry and public supply.
- 3.59 The NRA's regulatory role in the management of abstraction is governed by the Water Resources Act 1991, which sets out a system of Abstraction Licensing (see Section 4.54). Licences enable the NRA to control abstractions by setting limits on the amount which may be taken and the purposes for which water may be used. When considering new proposals, the NRA also has powers to impose conditions to protect the environment. Some small operations, such as those to supply a single household, are exempt from the need to obtain a licence from the NRA.
- 3.60 In some cases, abstracted water is returned directly to the river with minimal losses, as for example with cooling waters or gravel washing. Part or all of the public water supply abstraction may be for customers within the catchment in which case, a significant proportion may be returned to the river via consented effluent discharges. This return of effluent can play an important part in the maintenance of river flows.

Catchment Perspective

Current Use

- 3.61 The vast majority of abstractions within the Cherwell Catchment are for agricultural purposes. Rivers provide the main resource for abstraction (94%); licences for public water abstractions accounting for 64% of the total licensed abstraction (see Figure 13). Groundwater abstraction within the Cherwell Catchment is not extensive and is mainly for small agricultural supplies; none is used for public water supply.
- 3.62 Table 3 shows details of the amounts of water licensed for abstraction and actually abstracted from each type of source for a variety of purposes. Figures are in millions of litres per day (Ml/d) (1 Ml/d is equivalent to 220,000 gallons per day). The total authorised abstraction is about 23 Ml/d. The average amount of water input from rainfall, after evaporation and plant growth, which is effective in recharging groundwater and supporting river flow, is about 52 Ml/d.

River Cherwell Catchment Management Plan

Fig 13. Water Resources & Abstractions >1Ml/Day



NRA

National Rivers Authority
Thames Region

© Crown Copyright
© Ordnance Survey

B.W. GIS Section 07/34/535780



Scale - Kilometres



DRAFT
18 NOV 1994
GIS & MAPPING
READING

General Features		Water Abstraction Licences					
	CMP Boundary		Urban Areas		Public Water Supply >1Ml/Day		Springs
	Main Rivers				Other >1Ml/Day		Groundwater Level Monitoring Stn.
	Non Main Rivers				Surface Water Abstraction		Direction of Public Water Supply Movement
	Oxford Canal				Groundwater Abstraction		

Table 3: Mean Licensed and Actual Abstractions (Ml/d)

Use	Mean Licensed Abstraction			Actual Abstraction (1991)		
	Surface	Groundwater	Total	Surface	Groundwater	Total
Public water supply	14.53	0.00	14.53	6.49	0.00	6.49
Private water supply	0.13	0.07	0.20	0.08	0.05	0.13
Agricultural spray irrigation	0.57	0.06	0.63	0.19	0.03	0.22
Non-agricultural spray irrigation	0.08	0.00	0.08	0.02	0.00	0.02
Agriculture	0.10	0.98	1.08	0.09	0.88	0.97
Cooling	5.30	0.01	5.31	1.29	0.01	1.30
Industrial process	0.40	0.34	0.74	0.20	0.11	0.31
Transfer	0.16	0.00	0.16	0.05	0.00	0.05
Total catchment	21.27	1.46	22.73	8.41	1.08	9.49

3.63 Table 4 provides details of licensed abstractions of over 1 Ml/day.

Table 4: Abstractions of Greater than 1 Ml/day

Location	Source	Purpose	Max Daily	Av Daily	Max Annual
Shipton-on-Cherwell	River Cherwell	Spray irrigation, Cooling, Process	2.75	1.56	569.07
Bodicote PS	Sor Brook	Public water supply	4.55	4.55	1,663.84
Grimsbury Mill	River Cherwell	Public water supply	35.46	9.96	3,636.80
Banbury (Alcan)	Oxford Canal	Cooling	18.18	4.11	1,500.18

Future Use

3.64 A new intake for public water supply is to be opened soon at Bodicote, replacing the original. TWUL have agreed a Prescribed Flow and have undertaken environmental mitigation measures, such as covering the intake structures, located in the river bed, with gravel.

Environmental Objectives

- To manage water resources to achieve an acceptable balance between the needs of the environment and those of the abstractors;
- To ensure that licence holders understand and comply with the terms and conditions of the licences;
- To ensure that abstraction does not cause any deterioration of water quality.

EFFLUENT DISPOSAL

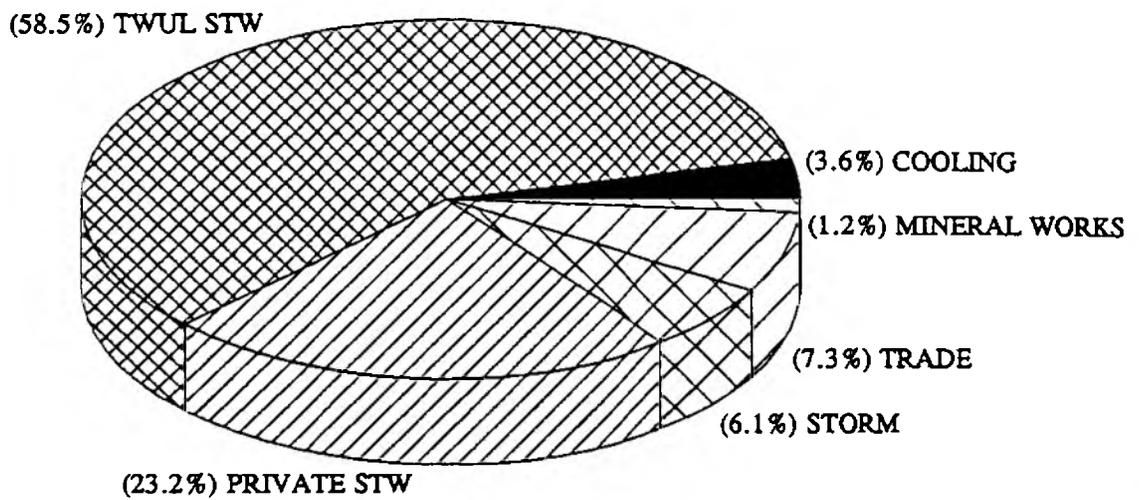
General

- 3.65 This use relates to the disposal of domestic, industrial and agricultural effluent to the river system and to ground. They are calculated in relation to the quality objective assigned to the receiving water. It follows that if there is any subsequent deterioration in upstream water quality, or diminution of river flow beyond the values used in calculating the consent, then downstream uses could be put at risk.
- 3.66 The discharge of effluent to the river system can affect both the quality and flow of a river and can play an important part in the maintenance of river flows.
- 3.67 Most discharges direct to rivers in the catchment are controlled by means of either NRA consents or HMIP authorisations. Consents and authorisations are legal documents issued by the regulators which impose conditions on the quantity and quality of a discharge in order to protect the environment. The regulators have powers to monitor both the quantity and quality of these discharges and if the conditions are not being met, to take enforcement action to ensure compliance.

Current Use

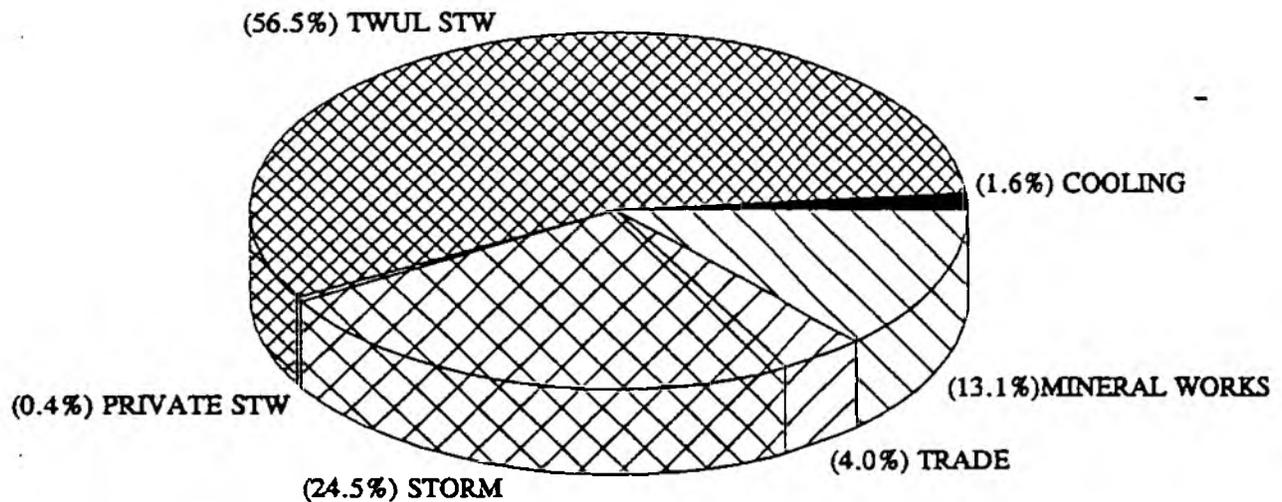
- 3.68 There are 153 discharges into the Cherwell Catchment, of which 82 have a maximum consented volume of greater than 5 m³/day. The majority of these discharges are from Thames Water Utilities Limited (TWUL) sewage treatment works (see Figure 14a). The greatest proportion by volume is also from TWUL sewage treatment works (see Figure 14b). The largest of these is Banbury Sewage Treatment Works, which is consented to discharge a maximum of 46,800 m³/day of treated sewage into the River Cherwell.
- 3.69 The sewage effluent discharges greater than 1,000 m³/day and the standards they are required to achieve are shown in Table 5.
- 3.70 In addition, there are three consented discharges of greater than 5 m³/day to groundwater. These are detailed below:
- Warmington: Wobbly Wheel Inn STW 20 m³/day;
 - Weston on the Green: Landscape House STW 10 m³/day;
 - Caversfield: Brashfield House STW 6 m³/day.

Figure 14a Consented Discharges Over 5m³/day



Total Numbers of Discharges Over 5m³/day = 82

Figure 14b Maximum Permissible Volume of Consented Discharges Over 5m³/day



Total Volume of Discharges over 5m³/day = 188,204m³/day

Table 5: Sewage Effluent Discharges Greater than 1000 m³/day

River and Effluent Source	Maximum Consented Discharge Volume m ³ /d	General Consent Conditions * (SS/BOD/Amm-N) all in mg/l
Cherwell Banbury STW	46,800	15/11/3 summer 15/11/5 winter
Langford Brook Bicester STW	27,000	25/12/8
Byfield Brook Byfield STW	3,200	40/40/20
Cherwell Chipping Warden STW	1,836	45/30/-
Gallos Brook Bletchingdon STW	1,146	40/20/15
Summerstown Ditch Marsh Gibbon STW	1,380	45/30/20
Hook Norton Brook Hook Norton STW	1,900	45/30/-

Note:

* where SS is Suspended Solids, BOD is Biochemical Oxygen Demand and Amm-N is Total ammonia expressed in terms of nitrogen content.

Future Use

3.71 The NRA have identified the need to make changes to the consents at 13 TWUL sewage treatment works in this catchment, in order to provide better protection for the aquatic environment. The location of these works is given on Figure 15. These proposed changes have been included in the TWUL Asset Management Plan (AMP2) recently submitted to the Office of Water Services (OFWAT). Discussions between the NRA and TWUL are in progress to agree priorities for improvements at sewage treatment works on a region-wide basis.

Environmental Objectives

- To regulate the discharge of effluent to the water environment so as to ensure that water quality objectives are achieved and that nature conservation, fisheries and recreation interests are not compromised;
- to ensure outfalls are located so as to achieve good effluent mixing with the river.

River Cherwell Catchment Management Plan

Fig 15. Water Quality: Effluent Disposal



NRA

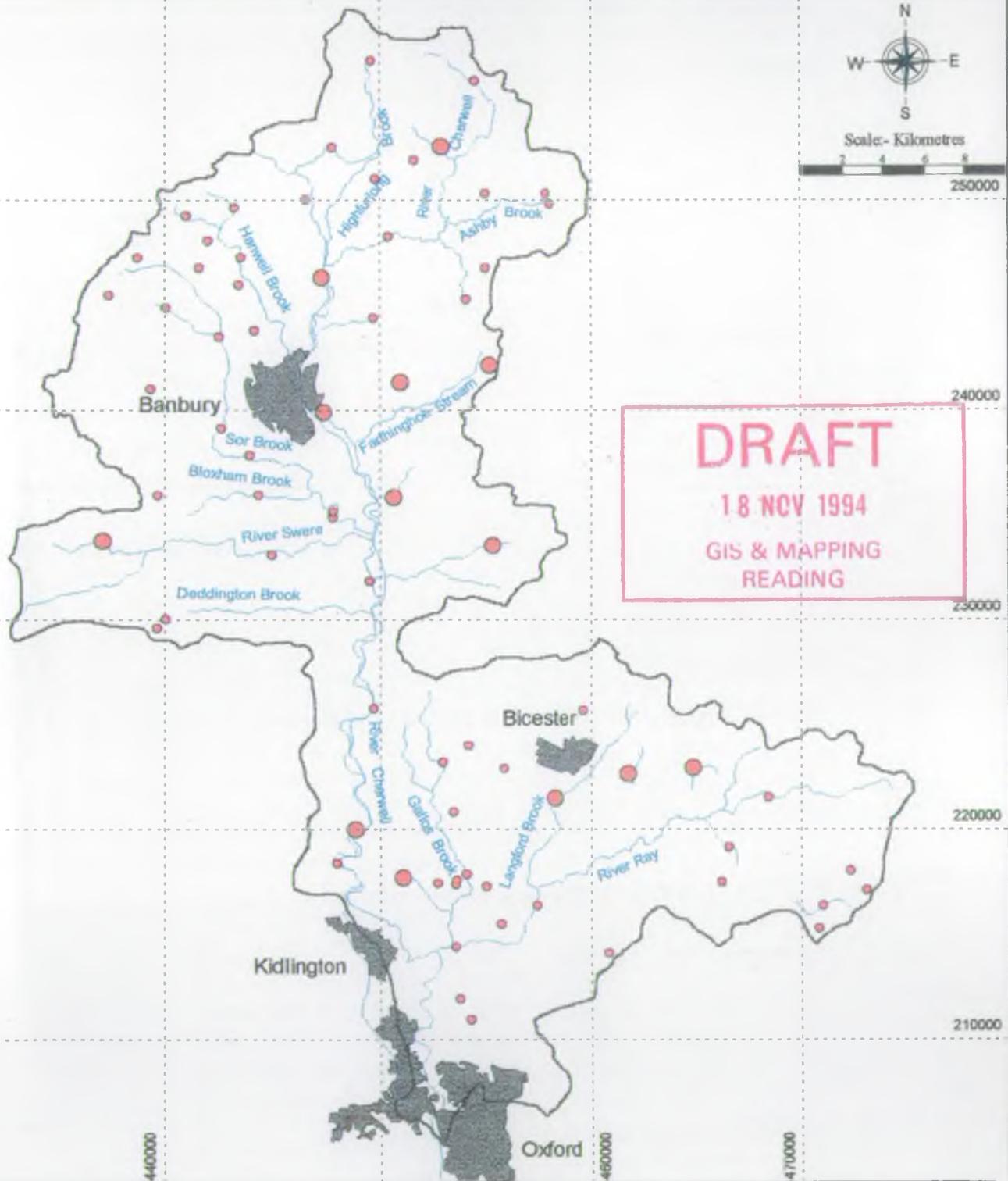
National Rivers Authority
Thames Region

© Crown Copyright
© Automobile Association

BNV GIS Section (D73Q 555780)



Scale - Kilometres



DRAFT
18 NOV 1994
GIS & MAPPING
READING

General Features		Effluent Disposal	
	CMP Boundary		Thames Water STW Proposed for AMP2 Improvement
	Urban Areas		Other STW (Discharge > 5m3/Day)

RURAL LAND USE

General

- 3.72 This section details the type and location of the main rural land uses within the catchment and identifies pressures on the land, along with agricultural and conservation policies developed to protect these areas.

Catchment Perspective

Current Use

- 3.73 Agriculture is the main land use in the catchment and has influenced the character of its countryside and landscape. The catchment has a high proportion of good quality Grade 2 agricultural land, particularly around Banbury, and one area of Grade 1 land to the west of Rousham Park. The Oxford Canal and River Cherwell valley is classified as Grade 4.
- 3.74 Historically, the area around Banbury and the Cherwell Valley thrived on its role as a centre for sheep and farming, and later, for agricultural processing. The valley floor is now characterised by open grazing with flood meadows to the north and areas of open arable farming and pasture to the south. On the valley slopes around Banbury and in the loamy soils of the flood plains to the south of Bicester, the land is used for arable farming.
- 3.75 There are small areas of woodland in the east of the catchment, to the west of Bicester and around Beckley, but the catchment as a whole has very little woodland. Consequently, the local authorities seek to secure replacement and new planting programmes within the districts.

Future Use

- 3.76 Pressures for housing and industry are not confined to urban areas within the catchment, but extend to varying degrees throughout the countryside. The catchment is generally an area of restraint but certain locations, particularly redundant airfields, including Upper Heyford, and other major redundant sites in the countryside could be the subject for new settlement proposals in the future.
- 3.77 Changes in EC and Central Government agricultural policy indicate that some of the arable land in the catchment could be put into non-rotational set-aside. The land adjacent to watercourses could be used to create buffers of woodland or grassland capable of enhancing the conservation value of the river corridor and reducing silt and pollutant loads entering surface waters.

- 3.78 Several areas are currently being managed under the Countryside Stewardship scheme operated by the Countryside Commission. An example in the catchment is a wetland site on a tributary of the River Cherwell at Eydon. One of the scheme's objectives is to restore neglected land or special landscape features and assistance could be available for the management of water meadows and grassland on riverside arable land or the improvement of the natural water corridor through programmes of willow pollarding. The sympathetic management of river meadows and promotion of habitat restoration, particularly in the area around the River Ray, would also benefit fisheries in the long term.
- 3.79 Part of the Upper Thames Tributaries Environmentally Sensitive Area (ESA), including the upper reaches of the River Ray, also lies within the catchment. This area was designated by MAFF in March 1994 and covers the Thames from Oxford to Kelmscott, including the floodplains of the Rivers Ray, Charwell, Evenlode and Windrush. The aim of the designation is to conserve and enhance the diverse wildlife of the area's valuable wet grassland. Farmers who enter the scheme must agree to farm in ways which help nature conservation, for example, by limiting their use of fertilisers and pesticides. They must also maintain landscape features, such as hedges, traditional farm buildings and trees. Farmers are encouraged to increase areas of grassland and to raise water levels to create the right conditions for nesting and over-wintering birds.
- 3.80 Both initiatives could influence the approach to the future management of rural areas.

Environmental Objectives

- To influence and manage future rural development in order to protect the water environment;
- To seek enhancements to the water environment through rural development and countryside initiatives.

URBAN LAND USE

General

- 3.81 Urban land use covers urban development, such as road construction and the growth of urban centres. This section details existing and proposed urban land use within the catchment and its associated implications for the water environment.

Catchment Perspective

Current Use

- 3.82 The scale of the rapid growth within Oxfordshire and Buckinghamshire during the 1960s and early 1970s has threatened the character of attractive towns and villages, the rural environment and high quality agricultural land within the catchment. The M40 was planned as a corridor for movement and its junctions have been the subject of significant development pressure. Pressure for the continued expansion of Oxford has threatened the historic character and rural setting of the city and, in 1992, the Secretary of State reaffirmed that the growth of Oxford should not continue indefinitely.

Future Use

- 3.83 Strategic areas for development and growth have been identified by Oxfordshire, Buckinghamshire, Warwickshire and Northamptonshire County Councils. Within the catchment, future development of land for housing, employment, retail, services and facilities would be principally located in the country towns of Banbury and Bicester. Over the next seven years, approximately 4,500 dwellings in total are likely to be built in Banbury and Bicester. Limited provision for housing and employment will also be made in appropriate locations in the smaller towns, including Chalcombe, Ambrosden, Hook Norton, Aynho, Milcombe and Bloxham. Elsewhere in the catchment, development will be diverted from both Oxford and the rural areas. Future urban development within the catchment, particularly at Banbury, could increase run-off into the Cherwell and its tributaries and, subsequently, increase the likelihood of flooding (see Figure 16).
- 3.84 The M40 and its junctions are likely to continue to be a focus for development pressures, including new Motorway Service Areas. Several major highway improvements will have a considerable impact on the water environment, including potential proposals for a second M40 motorway junction for Banbury. The scheme would enable motorway traffic to avoid the town but new bypasses would be required for villages on the routes leading to the new junction.
- 3.85 Upper Heyford air base has been released by the MoD for non-military development and, although the site is on an upland plateau, there is an opportunity for the NRA to get involved on planning and drainage issues. There is scope to produce an Area Specific Study for this site.

3.86 Outside the catchment area, development within other strategic growth areas, including Aylesbury, Didcot and Witney, may have implications for the water resources of the River Cherwell catchment.

Environmental Objectives

- To influence and manage future urban development in order to protect the water environment;
- To seek enhancements to the water environment through urban development and redevelopment;
- To ensure that the necessary infrastructure required for urban developments is provided in advance of its need and at no cost to the water environment.

River Cherwell Catchment Management Plan
 (Urban Land Use?)
 Fig 16. Planning Policy - Development



NRA
 National Rivers Authority
 Thames Region

© Crown Copyright
 © Automobile Association

BLN G3 Section (73-4) 535760



Scale- Kilometres



DRAFT
 18 NOV 1994
 GIS & MAPPING
 READING

General Features		Development Proposals			
	CMP Boundary		Development		Business
	Urban Areas		Employment		New/Improved Roads
	Main Rivers		Housing		Proposed Roads
	Oxford Canal		Industrial		

MINERAL EXTRACTION AND SOLID WASTE DISPOSAL

General

- 3.87 Mineral extraction has the potential to affect the catchment, both as a direct result of the extraction works themselves or through the discharge of effluent. In addition, the after-use of pits and other extraction sites may be of concern. The use of exhausted mineral workings as solid waste disposal sites has implications for ground and surface waters.

Catchment Perspective

Current Use

- 3.88 Ironstone reserves in the thin band of Marlstone on the Oxfordshire and Warwickshire border of the catchment are extracted for the production of architectural masonry, and used as a minor source of crushed aggregate and hard-core. There are three ironstone workings at Ratley, Hornton and Alkerton but the latter is not active at present. Limestone is found in a broad band running across the catchment from Stratton Audley in the east towards Tackley in the west, and to a lesser extent in a smaller band near Oxford. There are two active limestone and chalk workings at Woodeaton and near Ardley, and a soft sand working at Duns Tew. No mineral extraction takes place in Northamptonshire within the River Cherwell catchment.
- 3.89 Buckinghamshire has been a large producer of brickclay in the past. There is a major reserve of lower Oxford Clay south of Calvert, within the catchment boundary, but the production of Fletton bricks at the site was suspended in 1991. There was formerly a brickworks at Woodham and there is an outstanding planning permission which was granted in 1952 to work the upper Oxford Clay from about 120 hectares of land.
- 3.90 There are nine known active waste disposal sites within the catchment, which are licensed to dispose of household and other inert wastes (see Figure 17).

Future Use

- 3.91 No future areas of search for minerals in the catchment have been identified. Some outstanding planning permissions for the extraction of ironstone and clay granted in the 1950s and 60s may still be valid but are unlikely to be implemented over the next decade. Generally, the county councils seek to satisfy the demand for minerals from existing planning permissions and minimise the amount of land being worked.

River Cherwell Catchment Management Plan

Fig 17. Mineral Extraction & Solid Waste Disposal

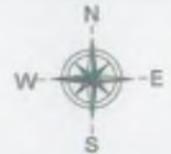


NRA

National Rivers Authority
Thames Region

© Crown Copyright
© Author's Association

BMW GIS Section (0734) 559780



Scale - Kilometres



250000

240000

230000

220000

210000

430000

440000

460000

470000



DRAFT
18 NOV 1994
GIS & MAPPING
READING

General Features		Mineral Extraction		Waste Disposal	
	CMP Boundary		Past Workings		Inert
	Urban Areas		Current & Approved		Acid Alkali
	Main Rivers				Household
	Oxford Canal				

3.92 Mineral extraction within the Area of Outstanding Natural Beauty, special landscape areas, river valleys and floodplains of the catchment is strictly controlled. Small workings to supply traditional building stone may be acceptable in the AONB or SLAs but the environmental impact of the quarry would need to be balanced against the local need for traditional building materials. The future restoration of mineral workings to lakes for nature conservation or recreation purposes may be acceptable.

3.93 Waste disposal by landfill within the catchment is likely to be restricted to disused or worked out mineral extraction sites, disused railway cuttings or other man-made voids. The need to protect watercourses and aquifers from leachate pollution, is recognised. Waste disposal issues are assuming an increasing significance in regional terms as the requirement for landfills is likely to exceed the capacity of available sites.

Environmental Objectives

- To influence and manage mineral extraction, restoration and after-use in order to safeguard the water environment;
- to ensure the sustainable use of resources whilst protecting the conservation value of the catchment and maximising the potential for enhancement;
- to exercise control to ensure waste disposal activities do not adversely affect the water environment.

FLOOD DEFENCE

General

- 3.94 Flood defence is concerned with the provision of effective defence for people and property against flooding from rivers and the sea. This use also relates to providing land drainage for agricultural areas within river valleys for which the level of the water table is of vital importance. Normally, flooding is a result of extreme climatic conditions, such as high winds or very heavy rainfall. Flood events are described in terms of the frequency at which, on average, a certain severity of flood is exceeded. This frequency is usually expressed as a return period, such as 1 in 50 years.
- 3.95 The effectiveness of flood defences can be measured in terms of the return period up to which they prevent flooding. It is clear that different types of land use, for example, urban areas and pasture land, require different levels of protection. The different land uses and the proposed targets for their protection are shown on Table 6.

Table 6: Land Use Bands

Land Use Band	Description of Typical Land Use	Typical Standard of Protection Return Period
A	Dense Urban Areas	At least 1 in 50 years
B	Suburban/Urban Areas (Less dense than Band A)	1 in 20 to 1 in 50 years
C	Limited numbers of communities and/or very intensive agriculture	1 in 10 to 1 in 50 years
D	Isolated and limited numbers of properties and/or arable farming	1 in 2 to 1 in 5 years
E	Very few properties and/or extensive grassland	Annual flooding
F	Any area to which a lower standard of service is offered for environmental or economic reasons	

- 3.96 For the purposes of management, certain reaches of the river are formally designated as Statutory Main River. On Main River, the NRA have special powers under the Water Resources Act (1991) to carry out works or control the actions of others. Any proposal that could interfere with the bed or banks or obstruct the flow in the river requires formal consent from the NRA. Under the Land Drainage Act (1991), the NRA also have a general duty to oversee, and have powers to control, significantly obstructive works on any watercourse. The criteria for designation of Main River are currently under review.
- 3.97 Frequently, flood risk reduction measures involve increasing the capacity of the channel to carry flood flows. The NRA undertake a rolling maintenance and repair programme of rivers and river control structures.

- 3.98 The nature of the works carried out for flood defence means that this use can come into conflict with other river uses - notably fisheries and conservation. Consultations are carried out and, where feasible, methods are devised whereby the river can achieve its flood protection target without significant habitat degradation.
- 3.99 Residential and commercial development in a river catchment is potentially a cause for concern. Urbanisation of an area increases the amount and rate of run-off into the river which can increase the risk of flooding. Development in the floodplain can be a particular problem as it places additional properties at some risk of flooding and reduces the natural flow attenuation properties of the flood plain. This can lead to higher river levels upstream and higher flows downstream of the development, and therefore an increased risk of flooding. The effects of development in a catchment therefore have to be considered very carefully, particularly if they are in the floodplain.
- 3.100 The NRA has developed a system to assess appropriate standards of service and to provide a consistent approach towards the provision of flood alleviation. This is known as "Standards of Service for Urban and Rural Flood Defence" or, more simply, "Standards of Service" (SoS).
- 3.101 This system sets targets for acceptable frequencies of flooding, such as once in twenty years, for each reach of a designated main river. Targets depend on the type of land use and the economic value of the land affected, for example, urban areas will have a higher target than unimproved farmland. The SoS approach provides the NRA with a method for prioritising its watercourse management activities.
- 3.102 Implementing the SoS policy requires a substantial amount of data. The acceptable standards and current frequency of flooding for each reach on a river needs to be determined and normally these data are obtained through intensive surveys of land prone to flooding and hydraulic modelling. Hydraulic modelling, in particular, requires large amounts of data and is a costly exercise. The NRA are implementing the SoS policy on a catchment by catchment basis as resources and funding permits.
- 3.103 NRA Thames Region also has a Non-Tidal Floodplain Policy. This policy seeks to limit development in areas which flood more frequently than once in one hundred years. Implementation of this policy is the responsibility of local authorities through their development plans. The NRA nationally has a crucial role in providing local authorities with accurate information on the 100-year floodplains, as outlined in the Memorandum of Understanding on development and flood risk. Under this agreement between the Local Authorities and the NRA, the Local Authorities are required to follow the NRA's advice on flood risk management and likewise the NRA will support Local Authorities if their development plans are appealed or challenged at a public enquiry.
- 3.104 Under Section 105 of the Water Resources Act (1991), the NRA is required to prepare surveys of areas where flooding problems are likely to arise. These surveys will form the basis of the NRA's advice to local authorities.

- 3.105 The Standards of Service system is a method for the NRA to prioritise its watercourse maintenance activities whereas the non-tidal floodplain policy is a mechanism to advise local planning authorities and others on future land use and protection of the floodplain.

Catchment Perspective

Current Use

- 3.106 Figure 18 details the areas within the catchment known to have flooded in the past and the limits of Main River, over which the NRA have permissive powers for flood risk management.
- 3.107 Banbury has been identified as a key development pressure area within Oxfordshire. Concern has been raised over changes in run-off resulting from development in the area and the impact this may have on flood flows and water quality. A group of landowners and farmers, concerned over the increased frequency of flooding of their land, has formed a new pressure group, FINCAG (Flooding in the Cherwell Action Group). Hydraulic modelling has been used to define the floodplain through Banbury and accurately assess whether new development is likely to impinge on the floodplain.
- 3.108 In September 1992, a 1-in-40 year flood event resulted in the flooding of Spiceball Park, including the Leisure Centre, which was constructed in the floodplain against NRA advice. As a result, Cherwell District Council are to raise embankments around the Sports Centre and remove a footbridge to prevent it acting as a constriction to flood flows.
- 3.109 Bicester is also an area under pressure from development, although the pace of development has slowed in recent years. There is a need for accurate identification and mapping of the floodplain within the town.
- 3.110 Run-off from the M40 has resulted in localised flooding problems, notably on the Hanwell Brook, where the raising of the bed level of a ford has resulted in flooding on the adjacent Alcan site.

Future Use

- 3.111 Stricter local authority planning policies are required to prevent the worsening of flooding problems. In addition, greater attenuation of run-off is required via source control, eg. soakaways, flood storage ponds, grass swales, etc. An Operational Investigation is to be commissioned to assess best practice for the creation and operation of balancing ponds and a multi-functional group has been set up within Thames Region to investigate source control.

River Cherwell Catchment Management Plan

Fig 18. Flood Defence



NRA

National Rivers Authority
Thames Region

© Crown Copyright
© Automobile Association

Scale: 1:250,000



Scale: - Kilometres



DRAFT
18 NOV 1994
GIS & MAPPING
READING

- 1. Bloxham
- 2. West Adderbury
- 3. Alcan Industry
- 4. Piddington
- 5. Ludgershall
- 6. Wendlebury

General Features		Flood Defence Features	
	CMP Boundary		Areas Known to Have Flooded
	Urban Areas		Sites at Risk
	Main Rivers		
	Oxford Canal		

Environmental Objectives

- To continue weedcutting and other minor channel works as necessary to minimise flood risk and to ensure that conservation guidelines are adhered to for good working practice for environmental sensitivity during river management operations;
- To implement the Standards of Service (SoS) policy in the Cherwell Catchment;
- To improve arrangements for flood forecasting and warning;
- Continue to disseminate information on flooding and flood protection measures to local authorities.

4 CATCHMENT STATUS

INTRODUCTION

- 4.1 This section compares the current status of the catchment with the objectives suggested in Section 3 and existing NRA standards and targets. Catchment status is considered in terms of water quality, water resources and physical features.
- 4.2 Comparison of the 'current status' with the 'overall objective' enables issues, which may be problems due to failures to meet targets or conflicts due to differing uses having opposing requirements, to be identified.
- 4.3 A range of data and information has been used to assess the catchment status. The assessment incorporates the results of the consultation exercise and analysis of existing publicly available data on the catchment.

WATER QUALITY

Introduction

- 4.4 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.
- 4.5 Water quality improvements cost money and, in many cases, it is the public who pay the bill for these improvements either directly or indirectly. It is important to relate the cost of any proposed improvements to the benefits in deciding on whether or not individual schemes should go ahead and in assigning priorities.

Surface Waters

Assessment of Surface Water Quality

- 4.6 The NRA uses two principal schemes for the reporting and management of river water quality; the General Quality Assessment (GQA) scheme and the Statutory Water Quality Objectives (WQOs) scheme. The GQA scheme is used to make periodic assessments of the quality of river water in order to monitor geographical and temporal trends. The scheme comprises four components - general chemistry, nutrients, aesthetics and biology - each providing a discrete 'window' upon the quality of the river stretches. The general chemistry component of the GQA is in current use and comprises six-tiered grades defined by standards for Dissolved Oxygen, BOD and Total Ammonia. The remaining three windows are still under development and will be applied when available.
- 4.7 The GQA chemical quality of rivers and canals in the Cherwell Catchment are shown on Figure 19. This shows the rivers in this catchment to be predominantly of fair quality (ie. sixteen reaches Grade C and ten reaches Grade D), a further fourteen reaches are of good quality (ie. Grade B) and six reaches in the catchment being of poor quality (ie. Grade E).
- 4.8 The WQO scheme establishes clear quality targets to provide a commonly agreed planning framework for regulatory bodies and dischargers alike. The proposed WQO scheme is based upon the recognised uses to which a river stretch may be put. These uses include: River Ecosystem; Special Ecosystem; Abstraction for Potable Supply; Agricultural/Industrial Abstraction; and, Watersports. The standards defining the five-tiered River Ecosystem (RE) use classes, which address the chemical quality requirements of different types of aquatic ecosystems, were introduced by The Surface Waters (River Ecosystem) (Classification) Regulations 1994. (Standards for further uses are still under development.)

For each stretch of river, a target RE class will be assigned, including a date by which this level of water quality should be achieved. Until WQOs are formally established by legal Notice served by the Secretary of State and, therefore, exist on a statutory basis, they will be applied on a non-statutory basis, with appropriate RE classes and target dates.

Table 7: Descriptions of Five River Ecosystem Classes

Class RE1	Water of very good quality suitable for all fish species
Class RE2	Water of good quality suitable for all fish species
Class RE3	Water of fair quality suitable for high class coarse fish populations
Class RE4	Water of fair quality suitable for coarse fish populations
Class RE5	Water of poor quality 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

- 4.9 Chemical standards have been derived for each of these classes and details of these standards are given in Appendix C1.
- 4.10 The new River Ecosystem classes were used to set water quality objectives for the Cherwell Catchment. The results are shown in Table 8. 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 1991 to 1993.
- 4.11 Those reaches which already comply with their objectives have the current date as their target date. Those reaches requiring some improvement have a target date set for the time when the improvements will take effect. These improvements include improvements to sewage treatment works which the NRA have advised Thames Water to carry out.
- 4.12 The objectives have been set by the NRA but they 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 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.

River Cherwell Catchment Management Plan

Fig 19. Water Quality: GQA (1991-93)



NRA

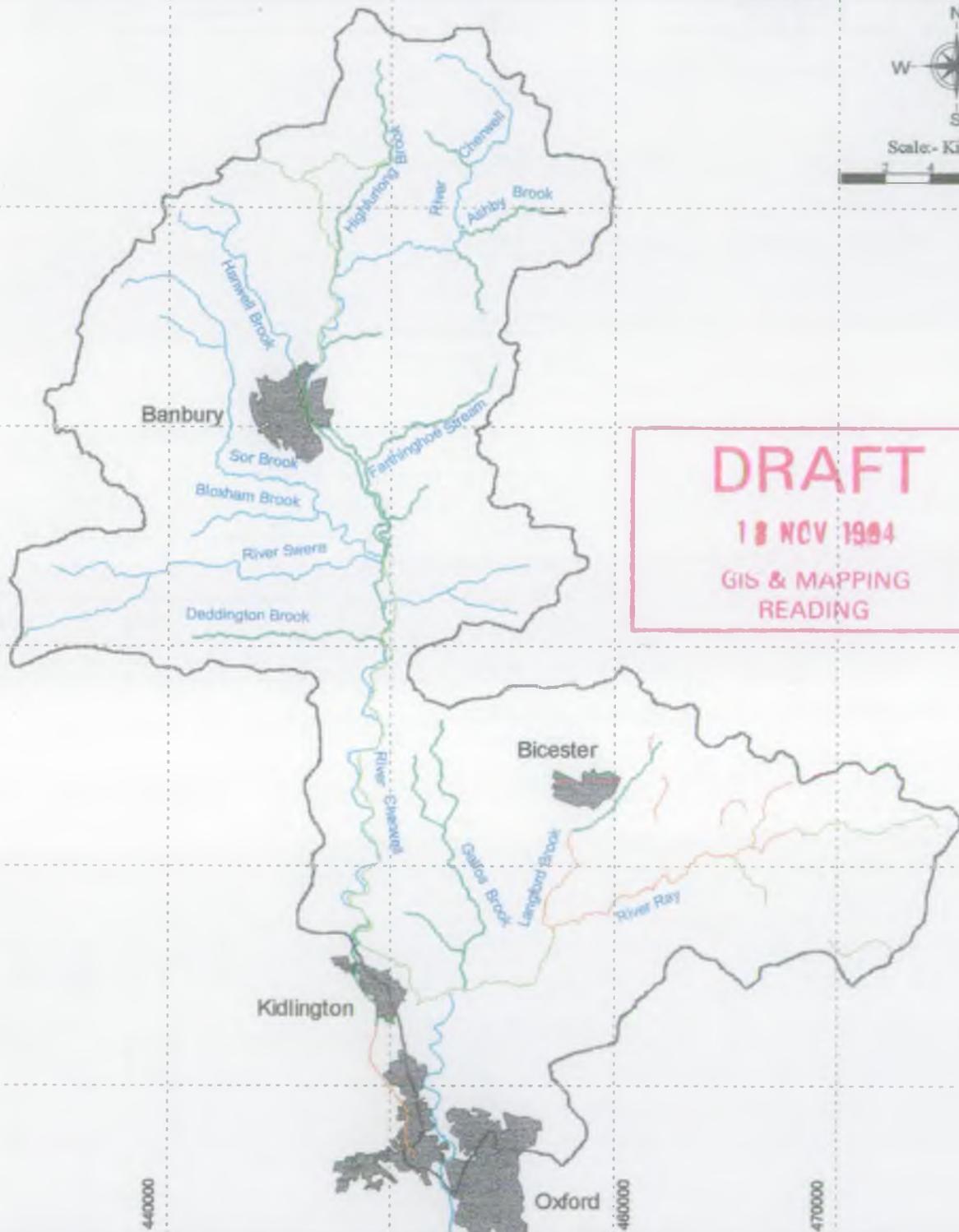
National Rivers Authority
Thames Region

© Crown Copyright
© Author's Association

BAW GIS Section (0734) 535700



Scale - Kilometres



DRAFT

18 NOV 1994

GIS & MAPPING
READING

General Features		General Quality Assessment 1991-1993			
	CMP Boundary		Class A		Class E
	Urban Areas		Class B		Class F
			Class C		No Data
			Class D		

**Table 8: Water Quality Objectives for
Rivers in the Cherwell Catchment**

Name	Reach	Length	WQO
Ashby Brook	Moreton Brook - Cherwell	7.0	RE3 (1994)
Audley Brook	Stratton Audley STW - Langford Brook	1.3	RE5 (1994)
Bletchingdon Brook	Bletchingdon - Gallos Brook	3.5	RE2 (2006)
Bloxham Brook	Milcombe - Sor Brook	7.8	RE2 (2006)
Boddington Canal Feed	Boddington Reservoir - Oxford Canal	5.4	RE4 (1994)
Byfield Brook	Westhorp - Cherwell	3.5	RE2 (2006)
Chacombe Brook	Chacombe STW - Cherwell	3.2	RE3 (1994)
Cherwell	Source - Banbury Water Intake	34.0	RE2 (2001)
Cherwell	Banbury Water Intake - Banbury STW	3.1	RE3 (1994)
Cherwell	Banbury STW - Kings Sutton Stream	7.3	RE3 (1994)
Cherwell	Kings Sutton Stream - Somerton Bridge	9.4	RE3 (1994)
Cherwell	Somerton Bridge - Oxford Canal (Middle)	19.6	RE2 (1994)
Cherwell	Oxford Canal (Middle) - Ray (Oxon)	10.7	RE2 (1994)
Cherwell	Ray (Oxon) - Thames	12.4	RE3(1994)
Croughton Brook	Source - Ockley Brook	4.0	RE2 (2006)
Culworth Brook	Thorpe Mandeville - Cherwell	4.3	RE2 (1994)
Deddington Brook	Source - Cherwell	16.1	RE3 (1994)
Farnborough Ditch	Avon Dassett - Hanwell Brook	3.1	RE2 (1994)
Farthinghoe Stream	Marston St Lawrence - Cherwell	10.1	RE2 (2006)
Gallos Brook	Caulcott - Ray (Oxon)	13.7	RE2 (2006)
Gubbinshole Ditch	Source - Ray (Oxon)	4.4	RE4 (1998)
Hanwell Brook	Avon Dassett - Oxford Canal	14.0	RE3 (1994)
Highfurlong Brook	Priors Marston STW - Cherwell	13.8	RE3 (1994)
Hooknorton Brook	Source - Swere	5.6	RE2 (1994)
Hornton Stream	Hornton - Sor Brook	3.7	RE2 (1994)
Kings Sutton Stream	Upper Astrop - Cherwell	2.8	RE4 (1994)
Langford Brook	Stratton Audley - Bicester STW	6.6	RE3 (1994)
Langford Brook	Bicester STW - Ray	5.4	RE4 (2006)
Launton Brook	Poundon Hill - Cutters Brook	4.6	RE4 (2006)
Leys Farm Ditch	Upper Heyford - Gallos Brook	6.0	RE3 (1994)
Ludgershall Brook	Ludgershall - Ray (Oxon)	3.0	RE4 (1994)

Table 8: Water Quality Objectives for Rivers in the Cherwell Catchment (Contd.)

Name	Reach	Length	WQO
Ockley Brook	Source - Cherwell	6.8	RE2 (1994)
Oxford Canal (Upper)	Alcan Intake - Cherwell at Aynho Crossover	11.8	RE3 (1994)
Oxford Canal (Upper)	Fenny Compton - Boddington Canal Feeder	2.5	RE4 (1994)
Oxford Canal (Upper)	Boddington Canal Feeder - Alcan Intake	10.5	RE4 (1994)
Oxford Canal (Middle)	Aynho Weir Lock - Cherwell at Bakers Lock	20.6	RE3 (1994)
Ray (Oxon)	Source - Grendon Underwood STW	7.7	RE4 (1994)
Ray (Oxon)	Grendon Underwood STW - Langford Brook	16.8	RE5 (1994)
Ray (Oxon)	Langford Brook - Gallos Brook	6.6	RE4 (1994)
Ray (Oxon)	Gallos Brook - Cherwell	0.8	RE4 (1994)
Sor Brook	Source - Bloxham Brook	22.7	RE2 (1994)
Sor Brook	Bloxham Brook - Cherwell	5.0	RE2 (1994)
Summerstown Ditch	Summerstown - Cutters Brook (Ray)	2.4	RE4 (2006)
Swere	Source - Barford St Michael STW	17.5	RE2 (2006)
Swere	Barford St Michael STW - Cherwell	7.4	RE2 (1994)
Tramroad Ditch	Gipsy Bottom - Wootton Brook (Ray)	3.4	RE4 (1994)

EC Directives

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

- 4.13 Nine of the reaches in this catchment have been designated under this directive as having water quality suitable for supporting cyprinid, (ie. coarse fish) fish populations. All the reaches are on either the River Cherwell or the Oxford Canal. The remaining 37 reaches are not currently designated. The reaches and their designations are shown on Figure 20. All the designated reaches passed the water quality standards given in the Directive for each of the three years in the period 1991-1993.

- 4.14 The NRA have recommended a further three reaches for designation as cyprinid waters under this Directive. These reaches are located on the Cherwell (Trafford Bridge to Grimsbury water works intake), on Sor Brook (from Wykham Mill to the Cherwell) and on the Lower Oxford Canal (from the Cherwell to the Castle Mill Stream).

The EC Directive on Pollution caused by certain Dangerous Substances Discharged into the Aquatic Environment of the Community (76/464/EC).

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

- 4.16 There are only two discharges consented for dangerous substances in the Cherwell catchment, Grimsbury water treatment works effluent and Calvert tip discharge. The discharge from Grimsbury water treatment works was given a consent to discharge iron in 1993. There has been one exceedance of the standard for iron since April 1993, which took place in March 1994 and has not re-occurred.

- 4.17 The discharge from the Calvert tip has been consented for cadmium, nickel, zinc and copper since 1991. There have been no discharges from this site since it was consented to discharge.

The EC Directive on Surface Water Abstraction for Drinking Water (75/440/EEC).

- 4.18 This directive is concerned with the quality of surface waters which are used as a source for water supply. The directive specifies the quality standards that water for abstraction must comply with.

- 4.19 There are two points monitored for compliance with this directive in the Cherwell catchment. One of these is on the River Cherwell at the Grimsbury water treatment plant intake. The river at this point failed to achieve the standards for barium and total hydrocarbons. The reason for the failure has not been identified but is being investigated. A second abstraction point exists on the Sor Brook at Bodicote. TWUL have recently renewed the licence for this abstraction and intend to use the abstraction in the future. When it is recommissioned, the NRA will monitor the Sor Brook for compliance.

River Cherwell Catchment Management Plan

Fig 20. Water Quality: EC Directive Designations



NRA
National Rivers Authority
Thames Region

© Crown Copyright
© Author's Association

BMV GIS Section (073-0) 535700



Scale - Kilometres



250000

240000

230000

220000

210000

430000

440000

460000

470000



DRAFT
18 NOV 1994
GIS & MAPPING
READING

General Features		EC Designated Fish Reaches		Other EC Designations	
	CMP Boundary		Salmonid		Surface Water Abstracted for Drinking Water Directive
	Urban Areas		Cyprinid		Dangerous Substances Directive-Monitoring Sites
					UWWT Sensitive Area

The EC Urban Waste Water Treatment Directive (91/271/EEC)

- 4.20 The Urban Waste Water Treatment Directive states requirements for the treatment of sewage according to the size of the discharge and the type and sensitivity of the receiving waters. Receiving waters which are sensitive to eutrophication problems are to be designated as sensitive areas (eutrophic) by the government, under the Directive. Phosphate removal at sewage treatment works discharging into these receiving waters is to be considered.
- 4.21 There is one watercourse designated as a sensitive area (eutrophic) in the Cherwell Catchment, namely the Langford Brook. However, since the Langford Brook is eutrophic upstream of Bicester STW, it was considered that phosphate removal from the works effluent would not significantly affect the level of eutrophication downstream.

The EC Directive concerning the Protection of Waters against Pollution caused by Nitrates from Agricultural Sources (91/676/EEC)

- 4.22 This directive is intended to reduce water pollution by nitrate from agricultural sources. This is to be done by designation of Nitrate Vulnerable Zones. The proposed vulnerable zones will be designated where surface waters intended for abstraction contain, or could contain more than 50 mg/l nitrate if protective action is not taken; where waters could become eutrophic if such action is not taken or where groundwaters could be affected. There is only one point in the Cherwell catchment where the surface water abstraction criterion applies. This is at the water intake at Grimsbury in Banbury. The exact extent of the vulnerable zone upstream of this point is still under consultation and due to be resolved by MAFF in December 1994. Further details can be obtained from MAFF, Nobel House, 17 Smith Square, London SW1P 3JR.

Biological Status

Biological River Quality Monitoring

- 4.23 The health of rivers is reflected in the variety and abundance of animal and plant life that they support. The NRA routinely monitors the macro-invertebrate life in rivers and streams at a network of biological sampling points. Aquatic macro-invertebrates are small animals which are visible by eye. A pollution incident may cause a noticeable change in the macro-invertebrates present at a site for many months. For this reason, biological monitoring provides a useful measurement of water quality, since it can take into account the effects of intermittent pollution which may remain undetected by standard chemical methods.
- 4.24 The biological quality of a site is indicated by the number of different macro-invertebrate taxa present and by their individual susceptibility to pollution. This is measured by using the Biological Monitoring Working Party (BMWP) Score System. BMWP Scores above 100 generally indicate good diversity, whilst scores below 20 occur at the most polluted sites. The most natural rivers and streams in

this area frequently achieve BMWP scores in excess of 150. It can be difficult to distinguish the effects of pollution from the effects of natural factors, such as changing sediments or flow rates. To overcome this, predicted scores are generated using a computer programme called RIVPACS (River Invertebrate Prediction and Classification Scheme), to which the observed scores can be compared.

Biological Fauna

- 4.25 The biological results for the most recent biological samples taken are represented on Figure 21. Appendix C2 includes further details of the results. The BMWP Score is shown, together with an indication of whether or not the score achieved the River Invertebrate Prediction and Classification System (RIVPACS) predicted score.
- 4.26 Excellent faunal diversity was found for most of the Cherwell, Croughton Brook, Ockley Brook, Oxon Ray at Islip and the Swere.
- 4.27 A large proportion of watercourses did not achieve their predicted status (26 out of 38). Seven sites showed particularly impoverished faunas where the BMWP Score has been consistently under 50: Audley Brook, Byfield Brook, Gubbinshole Ditch, Launton Brook, Leys Farm Ditch, Summerstown Ditch and Tramroad Ditch. As six of these are tributaries of the Rive Ray (Oxon), the results indicate that this area of the Cherwell Catchment has particularly poor biological communities. Possible causes for these poor biological qualities are given in Table 7. These mostly relate to STW and agricultural pollution and indicate that a pollution prevention programme could be required.
- 4.28 Several sites which have shown recent improvements in fauna include: the Cherwell at Water Intake Grimsbury, Deddington Brook at Cold Harbour Farm, Cherwell at Roadbridge, Twyford and Langford Brook at A41, Bicester.
- 4.29 Biological monitoring has shown a decline in the fauna at some sites. Since 1990, Bletchington Brook, Kings Sutton Stream and Leys Farm Ditch have shown a steady decrease in BMWP Score indicating a deterioration in water quality. Possible causes are given in Table 9, but further investigation is required.

River Cherwell Catchment Management Plan

Fig 21. Water Quality (Biology)



NRA

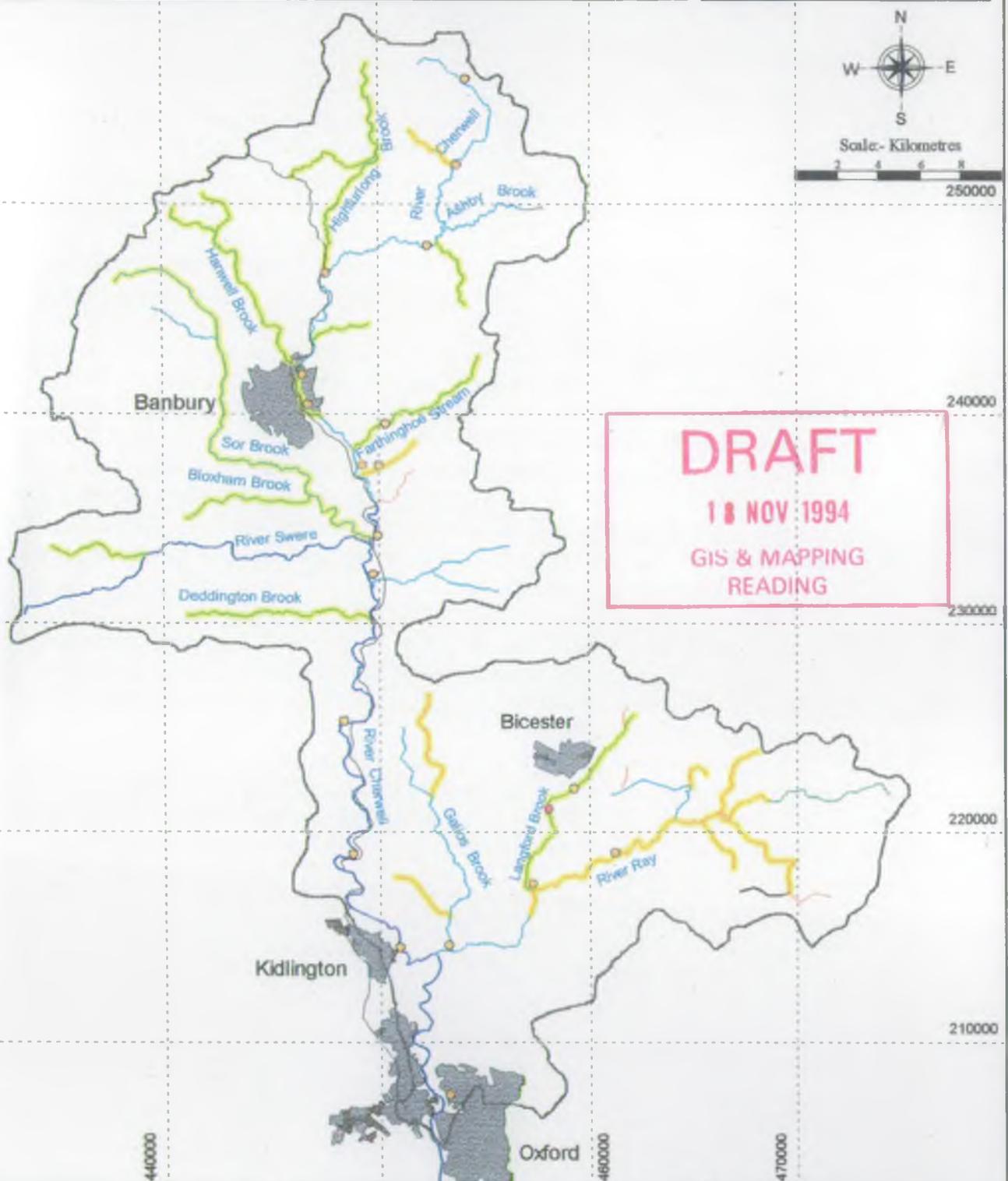
National Rivers Authority
Thames Region

© Crown Copyright
© Autodesk & Associates

BJM GIS Section 0734 530700



Scale - Kilometres



General Features		Biological Monitoring Working Party Score (1992-1993 Data)			Bacteriological Quality: Geometric Mean Values for E.Coli/100ml (1991-94)		
	CMP Boundary		151+ High Quality		0-15 Poor Quality		<100
	Urban Areas		100-150		No Data		100-2000
			51-100		Reaches Not Meeting Predicted Scores		>2000
			16-50				

Table 9: Reaches of Watercourses Demonstrating Poor Faunal Diversity and the Possible Causes

Watercourse	Biological Issue	Possible Cause	Comment
Audley Brook	Poor biology	Park Cottages STW, low flows	Further investigation is necessary
Bletchington Brook	Decline in faunal diversity since 1990	Bletchington STW, agricultural pollution	Further investigation is necessary
Byfield Brook	Poor biology	Byfield STW	Further investigation is required
Kings Sutton Stream	Decline in faunal diversity since 1990	Kings Sutton STW	Further investigation is required
Gubbinshole Ditch	Poor biology	Agricultural pollution	In agricultural areas intermittent farm pollution is a common problem
Launton Brook	Poor biology	Launton STW, agricultural pollution	Further investigation is required
Leys Farm Ditch	Poor biology, steady decline since 1990	RAF Upper Heyford STW and SWO	Further investigation is required
Summerstown Ditch	Poor biology	Marsh Gibbon STW	Further investigation is required
Tramroad Ditch	Poor biology	U/s STW, agricultural pollution	Further investigation is required

Aquatic Flora and Nutrient Status

- 4.30 Intensive macrophyte surveys are being conducted in relation to the Urban Waste Water Treatment Directive (UWWTD), Sensitive Areas (Langford Brook at Bicester) and the designation of nitrate vulnerable zones (Cherwell above Grimsbury WTW). The first macrophyte survey of the Langford Brook indicated excess nutrients below Bicester STW, with an increase in the percentage cover of filamentous algae (*Cladophora* spp), an indicator of eutrophication.

Microbiological Status

- 4.31 Total and faecal coliforms are indicators of the level of contamination by faecal material from animals and humans. Since 1991, a total of 115 water samples from 22 sites on six watercourses have been examined for the presence of *Escherichia coli*. The results of these surveys are detailed in Appendix C3. The sampling programmes were designed specifically to monitor sources of organic pollution and their effect on receiving watercourses. In addition, there are three sites which are monitored quarterly (for Total Coliforms and *E. coli*), for the estimation of compliance with the EC Surface Water Abstraction Directive.

- 4.32 Of the total number of samples 65% had bacteria present at "background" levels, 28% at levels commensurate with the presence of treated sewage effluent, 6% at levels commensurate with the presence of poorly treated sewage effluent and 1% at levels commensurate with gross faecal contamination.
- 4.33 Microbiological quality of the River Cherwell appears to be more variable both spatially and temporally than other watercourses sampled in the Thames Catchment, ie. all of the sites sampled exhibited a wide variation in bacterial numbers. It is likely that this variability is linked to the "flashy" hydrological regime of the river.
- 4.34 Sampling has been very limited on the tributaries of the River Cherwell but those sites examined have shown little cause for concern. The one exception is the Langford Brook at Wendlebury Crossing, where recent samples have reflected the proximity of the Bicester STW discharge.
- 4.35 At each of the surface water abstraction points, for the fourteen quarterly samples from 1 January 1991 to 30 June 1994, the overall compliance with the EC Surface Water Abstraction Directive was:

	Total Coliforms % Compliance	<i>E. Coli</i> % Compliance
River Cherwell, Grimsbury Intake	68.75	75
Grimsbury Reservoir	100	100
Sor Brook, Bodicote Intake	75	81.25

It should be noted that all these abstractions are disinfected, and therefore no risk to human health was caused by the failures.

Groundwater Quality

- 4.36 Industrial activities, such as gas and engineering works, may have resulted in the contamination of ground. Such sites may pose a risk to water quality, particularly during redevelopment. The use of soakaways for the disposal of road run-off and airfield run-off can contribute to the degradation of groundwater quality, for example when de-icers and herbicides become washed into the ground.
- 4.37 The NRA has a duty under the Water Resources Act 1991 to monitor and protect the quality of groundwater; to assist in this duty, the NRA has published a document entitled 'Policy and Practice for the Protection of Groundwater' (PPPG). The non-statutory policies described in the document are used as a framework for decision making on groundwater issues, particularly those relating to landfill activity, current and former industrial sites, use of soakaways (road and rail drainage), effluent discharges and agricultural activity.

- 4.38 A Regional Appendix is available, outlining the application of the policies as they affect aquifers in the Cherwell catchment area.
- 4.39 As part of the PPPG, the NRA is delineating Groundwater Protection Zones, within which certain activities could present unacceptable risk to the public supply boreholes around which they are drawn. The NRA seeks to control polluting activity within these zones especially. The location of zones, and information on their use are available from the NRA-TR offices in Reading.
- 4.40 In addition, maps are being published which give an indication of the groundwater 'vulnerability', in terms of the aquifer importance and the soil characteristics. Vulnerability Maps, at a scale of 1:100,000, covering the Cherwell catchment are due for release by A UK coverage map is provided with the PPPG document showing general categories of vulnerability. This map (scale 1:1,000,000) has already been published.
- 4.41 There are no statutory water quality objectives envisaged for groundwater in the near future. However, a network of groundwater monitoring sites is currently being established which enables the NRA to comply with its duty to monitor groundwater quality. There are currently approximately sites in the Cherwell catchment, although the programme is undergoing review at present.

Pollution

- 4.42 There are three main causes of surface and/or groundwater pollution: accidental or deliberate intermittent discharges from point sources, unconsented intermittent or constant point source discharges and other diffuse inputs.
- 4.43 The main source of accidental or deliberate intermittent discharges in rural catchments is often agricultural. The cause may be, for example, washing down of milking parlours or cattle stands, or leakage from silage clamps or slurry stores. The pollutant is generally organic in nature with associated high BOD and ammonia levels and may cause significant fish kills particularly where the discharge is to a small watercourse with limited dilution capacity. Pollution incidents may also occur as a result of spillages from commercial and industrial sources, for example oil or chemical stores, or due to failure at a public or private sewage treatment works. Other major potential sources are traffic accidents involving road or rail transport.
- 4.44 Most public sewage works have storm overflows to allow drainage outflows to bypass the works following heavy rainfall events. A storm water storage facility is often included at the sewage works to hold the initial flushing out flow. Nevertheless, stormwater overflows can significantly increase the pollutant load to surface waters. The NRA are steadily increasing the number of overflows controlled by a discharge consent but there remain a large number which are still unconsented.
- 4.45 Other pollutant sources which may or may not operate under a discharge consent are discharges from landfill sites, mine workings and quarries. The NRA is a statutory consultee on all planning applications for new developments and have a

duty to ensure that new sites do not impact upon the aquatic environment. Most old and disused sites, and some open sites have little or no control on pollutant movement and can cause pollution problems to both surface and groundwater resources.

- 4.46 Diffuse pollutant sources are often the result of agricultural practices. High nitrate concentrations are a particular concern in many catchments and causes include fertiliser applications and ploughing of fallow land, as well as sewage works and riverine organic inputs. The main sources of herbicide input are often not agricultural but due to weed control along roadsides, railway lines, etc. Pesticide and herbicide concentrations, along with nitrate are often the main concerns of water companies when meeting the EC Drinking Water Directive (75/440/EEC).

Pollution Incidents

- 4.47 Nationally, the number of reported pollution incidents has grown over recent years. This increase appears to be attributable to a range of factors, such as better communication facilities (eg. setting up and publicising of "Pollution Hotlines"), publicising the NRA and its functions and greater environmental awareness amongst the general public, rather than a genuine increase in pollution incidents.
- 4.48 The NRA divide pollution incidents into three classes, Major, Significant and Minor, depending on their severity. The criteria used to assess the class of incidents are given in Appendix C4.
- 4.49 Figures for reported pollution incidents in the Cherwell Catchment area in the years 1990 to 1993, are presented in Tables 10 and 11.
- 4.50 During the calendar years 1990-1993 inclusive, there were 592 incidents reported, 542 of which were classed as Minor, 49 as Significant and 1 as Major. The Major incident involved a chemical spill in December 1990, in which a small quantity of a pesticide was spilled in the King's Sutton Stream. The pollutant was detected along the entire length of the River Cherwell and into the Thames. However, the source was never traced.

Table 10: Reported Pollution Incidents by Type (1990-1993)

Pollution Type	Number of Incidents Reported			
	1990	1991	1992	1993
Oil	39	40	40	44
Chemical	30	17	15	12
Sewage	56	21	29	25
Natural	17	14	10	17
Agricultural	4	12	14	18
General	16	14	24	30
Urban run-off	5	1	0	3
Not known	8	10	1	5
Total incidents	176	129	133	154

Table 11: Classes of Reported Pollution Incidents (1990-1993)

Year	Number of Incidents Reported				Pollution Confirmed
	Minor	Significant	Major	Total	
1990	159	15	1	176	81
1991	122	7	0	129	56
1992	120	13	0	133	80
1993	140	14	0	154	97

Pollution Prevention

- 4.51 Many pollution incidents occur as a result of ignorance and in the mistaken belief that any liquid which passes to a drain goes to a sewage treatment works. This is not generally the case, especially in West Area, where most drainage systems run directly to watercourses or soakaways (groundwater).
- 4.52 Education is, therefore, a vital element in pollution prevention through all sectors of the community. The area's pollution prevention staff seek to achieve this by working together with industry, farmers, water companies and the general public, raising peoples awareness and providing free advice to resolve potential pollution problems.

4.53 The NRA have a programme of visits which target areas where occasional problems arise. In the Cherwell Valley, they are naturally all centred on the population centres of Banbury, Bicester and Kidlington. The following trading estates have been, or will be visited:

Banbury	Beaumont Road	(02/93);
Banbury	Wildmere	(11/93);
Banbury	Tramway	(11/94);
Banbury	Southam Road	(95/96);
Bicester	Launton Road	(95/96);
Kidlington	Langford Lane	(95/96).

4.54 In a predominantly rural catchment, the element of risk from agricultural premises is always present and the NRA's present programmed area is the River Ray (Oxon), in which every farm will be visited by the end of 1995.

4.55 Over and above the programmed work, visits to any premises to offer advice are made on request. This includes farm grant aid and incident follow-up work.

4.56 A number of initiatives have been taken to reduce pollution incidents by working with industry and other sectors:

- the Oxfordshire Business Environmental Group has over two hundred members who are keen to protect the environment. The NRA is one of the sponsors to their Waste Minimisation Club and has been active in promoting the concept of BS 7750, the new British Standard covering the production and implementation of Environmental Management Systems;
- the NRA are working with the Oxfordshire Fire Service to contain spillage incidents more effectively and have provided a wide range of equipment to facilitate this work;
- the NRA are working with British Gas on prevention measures at their installations;
- oil pollution is prominent in the incident statistics. The NRA will shortly be promoting oil recycling and visiting lakeside marinas and other installations;
- a number of Pollution Prevention Guidelines have been produced, tailored to various sections of industry. They were developed in the Thames Region and have been adopted nationally as common policy. They have been used as the basis of a mail shot to industries within the area, including:
 - transport and haulage companies;
 - bus and coach companies;
 - builders and contractors;

- plant hire companies;
 - retail foodstores;
 - schools;
 - councils.
-
- the NRA deal with a large number of enquiries, particularly from students and teachers and have produced a fact file on, amongst others, the River Cherwell;
 - Pollution Prevention staff take every opportunity to meet interested groups and organisations, such as local Womens Institutes, farmers groups and school classes.

Information on prosecutions and fines from 1991 to 1993 is listed in Appendix C5.

WATER RESOURCES

Introduction

- 4.57 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 water resources activities, the NRA has general duties to further the conservation and enhancement of the natural environment and has particular regard for the statutory obligations of the water undertakers.

Abstraction Licensing Policy

- 4.58 The NRA's regulatory role in the management of abstraction is governed by the Water Resources Act 1991, which sets out a system of Abstraction Licensing (see Section 3), 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 purposes for which water may be used and any necessary conditions to protect the environment.
- 4.59 In response to its duties under the Water Resources Act 1991, the Thames Region of the NRA has developed a set of formal policies for handling applications for licences and changes to existing licences (see Appendix C5). 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. It is also unlikely that the NRA would grant new licences authorising abstraction for continuous major abstractions (such as public supply).
- 4.60 The Water Resources Act 1991 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 in the understanding of what a living river needs to survive. In some cases, such as Bodicote on the Sor Brook, where licences have been varied, the opportunity has also been taken to include a prescribed flow limiting abstraction below defined river flows.

Catchment Perspective

- 4.61 The principal water (and sewerage) undertaking and abstractor in the catchment is Thames Water Utilities Ltd. Severn Trent Water and Anglian Water supply small areas around the headwaters of the Cherwell with resources from outside the catchment. The principal abstractions for public water supplies are Grimsbury (9.96 MI/d) on the Cherwell and Bodicote (4.5 MI/d) on the Sor Brook. Water resources are augmented by transfers into the catchment from the Farmoor

Reservoirs to Banbury, particularly at times of naturally low river flows. These transfers of treated water form part of an overall strategy for supply to the whole of TR Western area, based on the movement of water and its return to the river generally upstream of abstraction. The operation of strategic sources at Farmoor and Gatehampton, in conjunction with local resources, is used to meet demand across the whole of TR Western area.

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

4.63 Banbury has been identified as one of the key Oxfordshire development areas. Future growth in demand for water is anticipated in the medium term, to be met by further transfers of water into the catchment from the Farmoor reservoirs. This can be achieved by the substitution of resources currently supplied to Oxford from Farmoor with water transferred from the Gatehampton resource.

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

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

4.65 The canal infrastructure within the catchment has also been considered as a possible transfer route for new water resources but rejected because of the costs of making a new resource available elsewhere in the country. 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 the significant environmental impacts and planning constraints.

Low River Flows

4.66 The extended dry period from 1989 to 1992 has increased public awareness and concern about the impact of abstraction on river flows in the area. It is important to distinguish between the impacts of abstraction and the impacts of drought, which are beyond NRA control. The NRA nationally is developing a methodology for

assessing the severity of low flow conditions that may result from excessive, but authorised, abstraction.

- 4.67 This methodology has been applied to the River Cherwell following concerns expressed that the flow and ecology of the River Cherwell at Banbury may be adversely affected by abstraction from the river for public water supplies at Grimsbury. Although abstraction at Grimsbury is not significant for the majority of the time, under low flow conditions, abstraction can account for a significant proportion of the natural river flow. A preliminary assessment has been undertaken of conditions of the watercourse between the intake to the water works and the outfall from Banbury Sewage Treatment Plant, approximately 2 km downstream. These preliminary assessments indicate that the reductions in river flow may have a significant effect on the ecosystem of this stretch of watercourse.
- 4.68 Flow-gauging stations are proposed by the NRA on the Sor Brook and the River Ray, major tributaries of the River Cherwell.

PHYSICAL FEATURES

Flood Defence

4.69 The "Standards of Service for Urban and Rural Flood Defence" system relates flood defence standards of service to current land use within 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 classed into five land-use bands, which range from A (heavily urbanised) to E (unintensive agriculture). Each land use band has a "target range" of service levels, which specifies the maximum acceptable frequency of flooding. The target standards of service for river reaches within the catchment are listed in Appendix C6. As the Cherwell is mostly rural in character, most of the main river reaches have been ascribed a land-use band of E. The upper reaches of the Cherwell have been ascribed a land-use band of C (agriculture or amenity land).

4.70 There are a number of problems in applying these standards of service:

- (i) an area may not meet its target but the cost of works to ensure that the target is met may exceed the benefit;
- (ii) land use changes over time and, therefore, the standards of service targets may become out of date and may require constant updating;
- (iii) the standards only apply to certain reaches and the approach may not be consistent with a total river or total catchment approach.

4.71 As mentioned in Section 3, the Thames Non-Tidal Floodplain Policy seeks to limit development within the 1 in 100 year floodplain. If development is to be permitted in these areas, it must meet the following requirements:

- flood flows must not be impeded;
- the storage capacities associated with floodplains must not be reached;
- the number of people or properties at risk from flooding must not be increased;
- land required for maintenance of, or access to watercourses, must not be obstructed;
- environmental impacts must be kept to acceptable levels,

Target standards of service for the Cherwell catchment are detailed in Appendix C7.

Land Use Planning

4.72 As discussed in Section 3, the implementation of the Non-Tidal Floodplain Policy and DoE Circular 30/92 aims to ensure that the flood defence risks of a development are considered as an integral part of the decision making process undertaken by Local Planning Authorities on planning applications.

4.73 The NRA has also been working with Local Planning Authorities to integrate relevant water environment issues into statutory land use development plans. NRA Guidance Notes for Local Planning Authorities on the Methods of Protecting the Water Environment through Development Plans (NRA June 1993), cover the following issues:

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

4.74 The overall extent to which these policy areas have been taken up by local Planning Authorities is as follows:

- Aylesbury Vale DC;
- Daventry DC;
- South Northamptonshire DC;
- Oxford City Council;
- South Oxfordshire DC;
- West Oxfordshire DC;
- Cherwell DC;
- Stratford-on-Avon DC.

[NRA to supply data if available]

Riverine Environment

Introduction

4.75 The quality of the physical river environment is important in terms of the habitats and species it can support and has relevance for a number of NRA functions, including conservation, fisheries, landscape and recreation. Survey data can be used to monitor changes in the status of the river environment. No overall set of standards/targets currently exist for this area of concern and, at present, specific surveys are undertaken by individual functions, eg. river corridor surveys,

geomorphological field surveys and fisheries surveys. However, the NRA is currently undertaking research to formulate a general environmental surveying and classification system for river corridors.

- 4.76 The lack of comprehensive baseline data on the status of the river environment precludes a complete assessment of status at this stage. However, interpretation of data collected to date can provide an indication of the areas of value, as well as identifying particular concerns.

Ecology

- 4.77 River corridor surveys (ie. ecological surveys of the river channel and adjacent marginal habitat) of the River Cherwell and the River Ray are underway. There are a number of important habitats within the catchment, dependant on the river and vulnerable to damage by changes in water levels. These include a number of wetland meadow habitats, such as Otmoor SSSI and Bestmoor SSSI.
- 4.78 There are plans to assess the suitability of the river corridor of the Cherwell for use by otter populations as part of a long term goal to encourage the return of the species to the Thames Region

Fisheries

- 4.79 On the River Cherwell, the 52 km reach between Kings Sutton Stream and the River Thames is designated as a cyprinid fishery under the EC Fisheries Directive. Two reaches on the Oxford Canal (between the Summit and Hardwick Lock, and Aynho Weir Lock and Shipton Weir Lock) are similarly designated (see Figure 20).
- 4.80 The catchment has been historically managed for flood defence purposes and the fisheries habitat has, in places, suffered badly. Some habitat enhancement schemes, including construction of Off River Support Units have been undertaken on the River Cherwell at Red Barn and Kings Sutton.
- 4.81 The River Cherwell is predominantly a coarse fishery. A survey of the river was undertaken between August 1988 and August 1989 and it is due to be re-surveyed either in 1994 or 1995. In general, the fishery status of the river is good. Figure 11 shows biomass data for the watercourse. However, the survey identified a number of problem areas:
- water abstraction at Grimsbury, coupled with episodic discharges of poor quality surface water from Spiceball Park outfalls affected fish biomass between Grimsbury Reservoir and Banbury Sewage Treatment Works;
 - below Banbury Sewage Treatment Works, water quality was recorded as seriously affecting fish stocks. Since the survey, the sewage treatment works have been upgraded;

- unexplained low biomass figures were recorded at Somerton, Northbrook and Secut Farm and biomass at Cropredy had declined since 1978;
- historical management of the watercourse through the centre of Banbury for flood defence purposes has resulted in an over-deepened channel. This degraded habitat has resulted in reduced fish biomass.

4.82 The river was stocked with grayling and roach in March 1989, with bream in 1990 and with barbel, chub and dace in late 1993.

4.83 The River Ray was last surveyed in 1989. The survey showed that the river had the potential to support a good coarse fishery along all its length. However, at present, fish populations are limited in certain reaches by poor water quality. Bicester sewage treatment works was identified as having the most significant effects on water quality, and was identified in AMP2 for improvement.

4.84 The fishery could also benefit from habitat improvements, as much of the river has been impoverished by flood defence and land drainage works.

4.85 Selective reaches of the Oxford Canal were surveyed in 1990. Water quality problems from Alcan Industries were found to be adversely affecting fish populations. However, the company have since ceased discharging to the canal.

Biological

4.86 Macro-invertebrate sampling surveys (which reflect in part habitat quality) are undertaken regularly at a network of biological sampling points through the catchment as part of the routine biological/water quality monitoring strategy.

Landscape

4.87 No landscape assessment of the Cherwell Catchment has been undertaken.

Geomorphology

4.88 As yet, no comprehensive geomorphological survey of the River Cherwell has been carried out.

5 CATCHMENT ISSUES AND OPTIONS FOR ACTION

INTRODUCTION

- 5.1 This section identifies issues that have arisen through the catchment review process and as a result of internal and informal external liaison. Management options are suggested as ways of tackling these issues. As some of the actions suggested are outside the responsibility of the NRA, other organisations with appropriate interests are identified.
- 5.2 In identifying the catchment issues, the many key points and areas of concern have been consolidated into a small number of integrated categories.
- 5.3 The key issues identified as a result of the CMP process are:
- Water Quality: Current failure to achieve water quality objectives and predicted biological status;
 - Grimsbury public water supply intake;
 - Eutrophication problems in the Langford Brook;
 - Effluent discharge from Banbury Sewage Treatment Works;
 - Inadequate consent conditions - TWUL Asset Management Plan;
 - Recolonisation of the Catchment by otters;
 - Water levels on Otmoor and other wetland sites;
 - Low flows on the River Cherwell at Banbury;
 - Abstraction at Bodicote;
 - Water supply to Oxford Canal;
 - Water resources at Banbury;
 - Planning and flood defence in Banbury;
 - Lack of baseline data - additional survey requirements.

ISSUE 1 - WATER QUALITY: CURRENT FAILURE TO ACHIEVE WATER QUALITY OBJECTIVES AND PREDICTED BIOLOGICAL STATUS

Overview

- 5.4 The water quality objectives for a number of reaches are not being achieved. In addition, some watercourses are achieving low BMWP scores.
- 5.5 Five reaches have not yet achieved their WQOs. These are listed below in Table 12.

Table 12: Reaches not yet meeting their WQOs

Reach	WQO	Reason WQO not yet Achieved
Summerstown Ditch	RE4 (2006)	High BOD, ammonia and low dissolved oxygen. Due to Marsh Gibbon STW and agricultural pollution, combined with low flows
Launton Brook	RE4 (2006)	High BOD and low dissolved oxygen. Due to Launton STW, combined with low flows
Deddington Brook	RE2 (1994)	Low dissolved oxygen result. Due to one incident in 1991.
Gubbinshole Ditch	RE4 (1998)	Low dissolved oxygen. Due to agricultural pollution.
Byfield Brook	RE3 (2006)	Low dissolved oxygen. Due to Byfield STW.

- 5.6 The Summerstown Ditch, Launton Brook, Gubbinshole Ditch and Byfield Brook are producing poor BMWP scores for the same reasons.
- 5.7 In addition, the Audley Brook, Leys Farm Ditch and Tramroad Ditch have poor invertebrate fauna.

Strategies and Management Options

- 5.8 Steps already taken to address this issue are detailed below:

Summerstown Ditch: The source of the agricultural pollution has been located by NRA staff and the pollution halted. The quality of the ditch will be further improved due to changes to the discharge consent, proposed in the asset management plan (AMP2). These changes should enable the ditch to meet its quality objective by the year 2006;

Launton Brook: The NRA has recommended a tightening of the consent standards, under the AMP2 process for this sewage works, which will permit the brook to meet its objective by 2006;

Deddington Brook: This reach failed to achieve RE2 class in the 1991-93 period due to one very low dissolved oxygen result in 1991. The cause of this dip in oxygen was not located but it has not re-occurred. The NRA will continue to monitor this brook for further sudden changes in quality but is confident that the 1994 objective will be attained in the 1992-1994 assessment;

Gubbinshole Ditch: The source of the agricultural pollution has been located and pollution staff have taken enforcement action against the offender to prevent any further pollution occurring. The objective of RE4 should be attained by 1998;

Byfield Brook: Byfield sewage works has been identified for improvement in the AMP2 programme. Further investigation of other sources of pollution will also be necessary to maintain and improve the brook quality. The objective of RE3 should be attained by 2006.

5.9 In addition, the NRA will:

- undertake a pollution prevention programme in the Ray Sub-Catchment, visiting industries and farmers, offering guidance and advice;
- undertake further investigation into possible causes of pollution where they remain unidentified;
- conduct biological surveys to determine the cause of the poor biological quality in those watercourses with low BMWP scores;
- continue regular water quality and biological monitoring of watercourses;

Implementation

5.10 The NRA has a role in the continuation of monitoring and in the implementation of the pollution prevention programme. Farmers, FWAG, MAFF and local industries would also be involved. The tightening of discharge consents will involve close liaison with TWUL and they will take a lead in the upgrading of STWs under AMP2.

ISSUE 2: GRIMSBURY PUBLIC WATER SUPPLY INTAKE

Overview

5.11 There are a number of areas of concern regarding water quality in the vicinity of the Grimsbury public water supply intake. These are detailed below:

- barium and total hydrocarbon concentrations at the Grimsbury abstraction have been found to exceed the standards specified in the EC Surface Water Abstraction Directive (75/440/EEC). The reason for this failure has not been identified;
- concentrations of the herbicides MCPA and MCPB are exceeding guideline values as laid down in the EC Directive on the Quality Required of Surface Water Intended for Abstraction for Drinking Water (75/440/EEC);
- concerns have been raised over possible pollution from surface water run-off from the M40;
- the River Cherwell may be designated as a Nitrate Vulnerable Zone under the EC Directive concerning the Protection of Waters Against Pollution Caused by Nitrates from Agricultural Sources (91/676/EEC). The exact extent of the vulnerable zone upstream of the intake is still under consultation and due to be resolved by MAFF.

Strategies and Management Options

- 5.12
- continuation of NRA chemical and biological monitoring programme;
 - investigation into feasibility of installing automatic quality monitoring of the intake;
 - continuation of monitoring for herbicides by TWUL;
 - implementation of a pollution prevention and education programme aimed at farmers in the area;
 - further investigation to determine the source of high barium and total hydrocarbon concentrations;
 - ensure interceptors and balancing ponds treating M40 surface run-off are adequately maintained.

Implementation

- 5.13 The NRA will need to work closely with local farmers, FWAG and MAFF, to address the sources of agriculturally-related pollution. Pollution officers will also need to liaise with the Highways Agency regarding maintenance of interceptors and storage ponds along the M40.

ISSUE 3: EUTROPHICATION PROBLEMS IN THE LANGFORD BROOK

Overview

- 5.14 Under the Urban Waste Water Treatment Directive (91/271/EEC), the Langford Brook has been designated as a sensitive (eutrophic) area. The Directive instructs that phosphate removal at sewage treatment works discharging to designated waters be considered. However, since the Langford Brook is eutrophic upstream of Bicester STW, the DoE considered that phosphate removal from the work's effluent would not significantly affect the level of eutrophication downstream.

Strategies and Management Options

- 5.15 ● the NRA should undertake studies to identify sources of phosphates.
- 5.16 ● once sources and loadings have been identified land management practices/ water treatment technologies etc will need to be reviewed and an economic assessment made to establish costs to implement improvements. These will be implemented by relevant landowners and water sewerage undertakers.

ISSUE 4: EFFLUENT DISCHARGE FROM BANBURY SEWAGE TREATMENT WORKS

Overview

- 5.17 Trade effluent from the Kraft General Foods coffee manufacturing plant is discharged to sewer and is eventually treated at Banbury Sewage Treatment works. The effluent from the coffee manufacturing process is highly coloured, and the sewage treatment works processes have very little impact on the colour. Consequently the effluent discharged from Banbury STW is highly coloured, and causes noticeable discoloration of the Cherwell. The problem is not so much one of pollution, but of aesthetics and has caused numerous complaints from river users. At present there is no colour standard on the consent conditions for Banbury, however when the 'Aesthetics' window component of the General Quality Assessment scheme is introduced, this discolouration is likely to be highlighted further.

Strategies and Management Options

- 5.18 The NRA should review the consent and consider the application of a colour standard for the discharge.
- 5.19 TWUL should consider possible treatment options for reducing the coloured component in the effluent. This is likely to incur significant costs and it may be that TWUL would refuse to accept the effluent if a colour component were introduced to the consent.
- 5.20 Kraft General Foods should consider opportunities for partial or complete on-site treatment of the effluent stream/colour removal. It should be recognised that this is likely to incur significant investment and it is believed that such investment may well make the plant uneconomic.

Implementation

- 5.21 The NRA should convene a working group with Kraft General Foods and TWUL to establish economic and environmentally acceptable options for the discharge.

ISSUE 5: INADEQUATE CONSENT CONDITIONS - TWUL ASSET MANAGEMENT PLAN

Overview

- 5.22 The TWUL Asset Management Planning Process carried out in 1989 identified thirteen sewage treatment works within the catchment requiring upgrading or improvement. These include: Banbury, Bicester, Byfield, Cropredy, Croughton, Hook Norton, Kings Sutton, Launton, Marsh Gibbon and Middleton Cheney. Discussions between the NRA and TWUL are in progress to agree priorities for improvements.

Strategies and Management Options

- 5.23
- The NRA will carry out biological surveys upstream and downstream of those STWs whose consents are under review, to provide ecological data for the review process;
 - Actions for these STW will need to be prioritised.

Implementation

- 5.24 The prioritisation exercise will be carried out between the NRA and TWUL.

ISSUE 6: RECOLONISATION OF THE CATCHMENT BY OTTERS

Overview

- 5.25 The otter is a key species in the aquatic environment since it is near to the top of the food chain and, as such, is possibly the ultimate indicator of the health and quality of the riverine ecosystem. Environmental factors, such as pollution, that affect flora and fauna further down the food chain, therefore, impact on the otter community.
- 5.26 The late 1950s saw the beginning of a substantial decline in the UK otter population. This is thought to be due to a number of contributory factors:
- pollution studies have shown that the decline of the otter population appeared to be triggered by the introduction and widespread use of organochloride insecticides. Various bans and restrictions have now been placed on the use of persistent pesticides in this country and, since 1973, the use of PCBs has been limited through international agreement. As a result, their levels in the environment are slowly diminishing;
 - habitat loss - since the 1940s, production pressures on agricultural land has resulted in the extensive drainage of wetlands. In addition, there has been large-scale removal of trees and bankside vegetation along rivers intensively managed for land drainage purposes. This has resulted in widespread habitat loss for otters and other wetland wildlife, which is thought to be the primary factor limiting otter re-colonisation of the catchment today.

Strategies and Management Options

- 5.27
- assess the suitability of the use of the catchment by otters;
 - work with riparian owners and conservation bodies to protect suitable sites;
 - work with riparian owners and interested groups to enhance potential sites;
 - seek sponsors to co-fund future otter projects.

Implementation

- 5.28 If funding is achieved, the NRA will initiate the project, which should be run by conservation groups, such as BBONT and Local Wildlife Trusts. The NRA will also need to liaise closely with riparian owners.

ISSUE 7: WATER LEVELS ON OTMOOR AND OTHER WETLAND SITES

Overview

- 5.29 Wetland habitats, such as Otmoor, located along the river valley depend on winter flooding and high water levels to maintain their conservation interest. Several farmers in the catchment have entered into Countryside Stewardship Schemes, with the aim of keeping water levels high and allowing seasonal grazing of the wetlands. However, this has led to opposition from farmers wishing to grow arable crops and requiring drier conditions. Thus, some parts of Otmoor are actively pump drained, resulting in hydrological fragmentation of the area.
- 5.30 The NRA have recently installed automatic sluice gates on the River Ray to allow remote control operation of water levels from an area controlled network. A flow gauging station is proposed on the River Ray.
- 5.31 MAFF have produced a guide 'Water Level Management Plans - A Procedural Guide for Operating Authorities' (1994), to assist operating authorities responsible for flood defence and land drainage in the preparation of such plans. Water Level Management Plans provide a means by which the water level requirements for a range of activities in a particular area, including agriculture, flood defence and conservation (for example, water dependant SSSIs) can be balanced and integrated. Part of this guide stresses the importance of water levels to agriculture and soil structure. Otmoor has been identified as a Priority 2 site, which means a Preliminary Management Plan will have to be produced by April 1996.

Strategies and Management Options

- 5.32
- NRA to prepare a water-level management plan (in accordance with MAFF Guidelines) to address the conflicting requirements of landowners, farmers and nature conservation;
 - inter-functional collaboration to encourage more sympathetic management of all wetland meadows within the catchment;
 - education of riparian owners as to the value of flood meadow habitats, both as flood storage areas and as areas of conservation importance.

Implementation

- 5.33 In order to prepare the Management Plan, the NRA will need to liaise with landowners and English Nature.
- 5.34 Conservation and flood defence functions within the NRA need to liaise closely and work together with riparian owners. External conservation bodies, such as the Countryside Commission, FWAG and the RSPB, also have a role to play.

ISSUE 8: LOW FLOWS ON THE RIVER CHERWELL AT BANBURY

Overview

- 5.35 TWUL currently have a licence to abstract 9.96 Ml/day from Grimsbury for public water supply. Much of this water is returned to the River Cherwell, as effluent via Banbury STW, 2 kilometres downstream. Although the abstraction at Grimsbury is not significant for the majority of the time, during dry periods river abstraction can account for a significant proportion of the natural river flow, resulting in depleted flows over a 2 km length of the river through Banbury. This has resulted in a reduction in the aesthetic and ecological value of the watercourse.
- 5.36 Although this reach did not figure as significant on a regional basis when assessed using NRA accepted methodology for assessing the severity of low flows, it flows through an area of high amenity and recreation value and is perceived as a significant issue within the catchment.
- 5.37 A secondary problem is that during periods of low flows, effluent discharged from Banbury STW remains largely undiluted, which has had an impact on water quality and instream flora and fauna downstream. The problem may be further exacerbated by surface and stormwater drainage discharges. Banbury STW were recently upgraded. The resultant effect on water quality has yet to be evaluated.
- 5.38 Historical management of the river for flood defence purposes has resulted in an over-deepened channel with little or no morphological diversity. This, in turn, limits instream habitats.

Strategies and Management Options

- 5.39
- Carry out more detailed investigations to establish the nature and severity of the problem. Any actions and priorities will be considered in comparison with other low flow rivers within the region;
 - investigate feasibility of reducing level of abstraction by TWUL at Grimsbury. This is a sensitive issue between TWUL and the NRA, as TWUL would be entitled to financial compensation for a reduction their licence;
 - investigate feasibility of carrying out in-channel works to accommodate varying flows;
 - investigate possibility of carrying out landscape enhancement works along the river corridor, both in the reach affected by low flows and further downstream;
 - assess extent of any improvements in water quality resulting from the upgrading of the STW.

Implementation

- 5.40 Close liaison and negotiation with TWUL will be required regarding abstractions. Cherwell District Council should be involved in any enhancement schemes.

ISSUE 9: ABSTRACTION AT BODICOTE

Overview

- 5.41 TWUL have recently applied for a renewal for their abstraction licence on the Sor Brook at Bodicote. The NRA successfully negotiated a Prescribed Flow on the abstraction licensed, along with the inclusion of environmental mitigation measures, such as locating the intake structures below the river bed and covering them with gravel.

Strategies and Management Options

- 5.42
- A flow-gauging station has been installed to monitor flows and hydraulic modelling has been undertaken to provide baseline data for river levels;
 - monitoring of flows; carry out periodic surveys of fauna and flora.

Implementation

- 5.43 The NRA are responsible for monitoring the situation to ensure the licence conditions are not breached and to assess the effects of abstraction on flora and fauna. Continuing liaison with TWUL will be necessary.

ISSUE 10: WATER SUPPLY TO OXFORD CANAL

Overview

- 5.44 The Oxford Canal is currently supplied with water from Boddington Reservoir, which is in turn supplied from the Highfurlong Brook. Towards late summer, levels in the reservoir tend to be quite low and there is a significant shortage of water in the upper reaches of the canal. Water is pumped from the River Cherwell to the canal in order to augment the flow.
- 5.45 Interconnections between the Oxford Canal and the River Cherwell occur along the river's length. As a result, silt transfer occurs between the canal and the river, resulting in turbid water, with a high suspended solid content which reduces the aesthetic quality of the river.

Strategies and Management Options

- 5.46
- BW are currently undertaking a study to determine whether it is feasible to enlarge the reservoir to meet this demand;
 - BW are undertaking an on-going programme of dredging along the canal. Silt surveys have been carried out.

Implementation

- 5.47 BW are currently seeking a solution to the problem and will need to liaise closely with the NRA in both selecting and implementing the solution.

ISSUE 11: WATER RESOURCES IN BANBURY

Overview

- 5.48 Banbury has been identified as a development growth area, with an associated increased water resources demand. However, strategic links in the Upper Thames Supply System, coupled with conjunctive use (Gatehampton, Grimsbury, Farmoor), means that this demand forecast should be covered until 2016. TWUL may have to duplicate the pipeline supplying water from Farmoor to Banbury in the next twenty years or so.

Strategies and Management Options

- Promote water efficiency;
- monitor and review the need for additional water resources periodically;
- establish environmental acceptability, benefits and risks associated with strategic and local water resource options over the region as a whole;
- continue to work with TWUL to encourage them to improve the efficiency of their distribution system within economic and practical limits.

Implementation

- 5.49 The NRA will need to continue to inform and educate the general public on the efficient use of water. Close liaison with TWUL will also be required to monitor demand and supply forecasts and progress the development of additional water resources.

ISSUE 12: PLANNING AND FLOOD DEFENCE IN BANBURY

Overview

5.50 Banbury is a key development pressure area in Oxfordshire. A large section of the town, adjacent to the River Cherwell and the Oxford Canal, is within the floodplain. Development here is at risk from flooding and is generally discouraged by the NRA. There is public concern that recent development may have increased the frequency of flooding in some areas. A group of landowners and farmers concerned over the increased frequency of flooding of their land, has formed a pressure group: FINCAG (Flooding in the Cherwell Action Group). FINCAG is monitoring water levels and liaising with the NRA to gain a better understanding of flooding in the area. In addition, Banbury has a complex surface water drainage system, with an inefficient, combined foul and surface water sewerage system. Thus, during heavy rainfall, this can increase flooding problems and has implications for water quality.

Strategies and Management Options

- 5.51
- Stricter planning controls and policies are required to prevent additional development in the floodplain. This will be achieved through ensuring NRA interests continue to be included in development plans and are addressed through statutory consultation process;
 - hydraulic and hydrological studies have been carried out by the NRA to determine the exact extent of the 1 in 100 year floodplain, and to assess the impact of past and future development within the town on the drainage system. The results of these studies will enable a drainage strategy to be developed;
 - Section 105 surveys will be carried out to facilitate floodplain mapping;
 - for future development in Banbury, the NRA will be seeking to attenuate peak flows discharging to the Cherwell, via source control (eg. soakaways, grass swales, storage ponds, etc). A multi-functional group has been set up within the NRA-TR to investigate methods of source control;
 - an Operational Investigation to assess best practice for the storage of water, using balancing ponds, is to be commissioned by the NRA.

Implementation

5.52 Close liaison is required with Cherwell District Council to identify NRA concerns and enforce policies controlling development within the floodplain.

ISSUE 13: LACK OF BASELINE DATA - ADDITIONAL SURVEY REQUIREMENTS

Overview

- 5.53 As yet, no detailed landscape or geomorphological surveys or assessments of the catchment have been undertaken. In addition, there is a need to include the identification of floodplain habitats as part of Phase II Habitat Surveys undertaken within the catchment.
- 5.54 This baseline data is essential to establish an accurate picture of existing conditions within the catchment and enable any changes to be monitored.

Strategies and Management Options

- NRA to carry out geomorphological assessments of the River Cherwell catchment;
- NRA to carry out a landscape assessment of the catchment;
- NRA to ensure that habitat surveys carried out by themselves and others cover floodplain habitats where relevant.

6 THE NEXT STEPS

6.1 This document has been produced through internal discussion, informal liaison with a wide range of organisations (see Appendix B) and a desk study of readily available reports produced by organisations such as local authorities.

6.2 Whilst every effort has been made to ensure the accuracy of the information the plan may contain a number of omissions and inaccuracies. The next step, therefore, is to formally consult with organisations, groups and individuals interested in the future of the catchment's water environment. Consultation will enable the NRA to:

- (i) clarify the extent and distribution of current uses of the catchment;
- (ii) assess the importance of catchment uses;
- (iii) identify the wide range of likely, possible and potential future catchment uses;
- (iv) expose catchment specific issues to a wide audience;
- (v) ensure decisions on the future management of the catchment are based on accurate information and the fullest possible range of views from interested parties.

6.3 In commenting on this plan it is hoped that both points of detail and strategic issues will be tackled. In particular the following questions should be considered:

- (i) have the current and future uses of the catchment been correctly identified?
- (ii) have the issues been fairly addressed and what opinions do you have on them and the options we propose?
- (iii) have any issues been overlooked?
- (iv) how should the evaluation of the issues and the development of strategies and action plans be progressed?

6.4 During the consultation period comments can be submitted in writing to:

River Cherwell Catchment Management Plan
National Rivers Authority Thames Region
Isis House
Howbery Park
Wallingford
Oxon OX10 8BD

- 6.5 The CMP Project Manager, Mr Jamal A Hamid, or Tania Woodward (Catchment Management Officer), can also be contacted on (0734) 533304 or 533309, respectively. All comments must be with us by
- 6.6 The consultation phase incorporates a number of separate but linked activities. These include:
- (i) a launch;
 - (ii) distribution of the full plan and/or a summary leaflet of key organisations, groups and individuals;
 - (iii) a display for use in libraries and other public areas;
 - (iv) public meetings as appropriate; and
 - (v) news, radio and television releases.
- 6.7 At the end of the consultation phase, results of the process will be considered in detail before producing a definitive Catchment Management Plan. The Final Plan will define both a strategy for the future management of the catchment and a series of action plans for the NRA and others to implement in order to deliver the strategy.
- 6.8 The information and views you provide are therefore a very important step in the overall process. It is hoped that you will respond positively to this initiative so that a shared vision for the River Cherwell Catchment can be developed.

APPENDIX A:
NRA Aims and Strategies and Organisation Responsibilities

APPENDIX A: NRA Aims and Strategies and Organisation Responsibilities

NATIONAL RIVERS AUTHORITY (NRA)

Aims

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

Water Quality

A.1 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.

A.2 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.

A.3 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.

A.4 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.

A.5 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.

A.6 The NRA's Strategic Objectives regarding water quality 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

A.7 Conservation activities of the NRA aim to:

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

A.8 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.

A.9 The NRA's Strategic Objectives in relation to conservation are:

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

Recreation

A.10 The NRA has statutory duties to:

- develop the amenity and recreational potential of waters and land owned by it; and
- promote water recreation on all inland and coastal waters generally within its aims of environmental guardianship and improvement.

A.11 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.

A.12 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.

A.13 In addition to these recreation and amenity considerations, the NRA, where it is the authority, has responsibilities towards the maintenance and improvement of waterways for navigation.

A.14 The NRA's Strategic Objectives regarding recreation are:

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

Fisheries

- A.15 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.
- A.16 An essential feature of the Water Resources Act 1991 is the statutory duty placed on the NRA to "maintain, improve and develop fisheries". The term "fisheries" encompasses both sport fisheries and commercial fisheries, however the Act extends further to effectively cover all inland waters, other than fish farms, which are regulated by the Ministry of Agriculture, Fisheries and Food, which have the capacity to support fish. Sport fisheries include waters such as rivers, streams, canals, lakes, ponds and reservoirs.
- A.17 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.
- A.18 The costs of the fisheries service are met, in part, by funds raised from rod licence sales.
- A.19 The Strategic Objectives of the NRA Fisheries function are:
- to protect and conserve salmon, trout, freshwater, eel and, where appropriate, coastal fisheries;
 - to regulate fisheries through the enforcement of a consistent series of licences, orders, byelaws and consents;
 - to monitor the fisheries status of rivers and inland estuaries and, where appropriate, coastal waters;
 - to formulate policies to maintain, improve and develop fisheries and restore and rehabilitate damaged fisheries;
 - to 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

- A.20 The NRA has powers to:
- protect people and property against flooding from rivers and the sea;
 - provide a means for the drainage of land; and,

- provide adequate arrangements for flood forecasting and warning.
- A.21 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, responsibility rests with either the District or Borough Council or Thames Water Utilities.
- A.22 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.
- A.23 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.
- A.24 The NRA's Strategic Objectives in relation to flood defence are:
- to develop and implement the 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

- A.25 The NRA'S future strategy for navigation is to take a lead in working with other navigation authorities 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 navigation 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.

A.26 The NRA's Strategic Objectives in relation to navigation are:

- to contribute to the development of an overall navigation strategy for England and Wales;
- to regulate NRA navigation through the enforcement of a consistent series of licences, orders, byelaws and statutes;
- to maintain and improve NRA navigation fairway, facilities and standards;
- to recover from users the costs of providing specific navigation facilities and a reasonable proportion of the costs of maintaining the navigation.

Land Use Planning

A.27 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.28 A close working relationship is required with both County, District and Borough Councils on mineral workings, waste disposal issues, infrastructure works, works within river corridors or floodplain, and any activities likely to pollute surface or groundwaters or increase the demand for water resources.

A.29 Guidance notes for local planning authorities on the methods of protecting the water environment through development plans have been produced (September 1993), and these are being promoted in conjunction with the initiative to prepare Catchment Management Plans.

Summary

A.30 Further details on the work of the NRA can be found in a series of NRA strategy documents covering: 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 the NRA's head office in Bristol.

Six Main Aims of the Environment Agency

A.31 The aims are:

- (i) to provide effective environmental protection, management and enhancement, particularly in ways which take account of impacts on all aspects of the environment;

- (ii) to impose the minimum burden on industry and others consistent with the above, including by developing single points of contact through which industry and others can deal with the Agency;
- (iii) to operate to high professional standards, based on the best possible information and analysis of the environment and of processes which affect it;
- (iv) to organise its activities in ways which reflect good environmental practise and provide value for money for those who pay its charges and taxpayers as a whole;
- (v) to provide clear and readily available advice and information on its work;
- (vi) to develop a close and responsive relationship with the public, local communities and regulated organisations.

Other Organisations

Water and Sewerage Undertakers

- A.32 These private companies are responsible for providing water supplies for domestic and industrial use and the management of sewage treatment works. Thames Water Utilities Limited is the main water utility company in the catchment.

Her Majesty's Inspectorate of Pollution (HMIP)

- A.33 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 and water. Thus, HMIP control potentially significant industrial discharges to the water environment, whilst discharges from sewage treatment works and other discharges to water are regulated by the NRA.

Drinking Water Inspectorate (DWI)

- A.34 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.35 A government agency responsible for making sure that the water and sewerage undertakers provide customers with a good quality and efficient service at a fair price.

District or Borough Councils

- A.36 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.
- A.37 Watercourses which have not been statutorily designated as "main river" on maps held by the NRA and the 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 district or borough council.

British Waterways (BW)

- A.38 Created by the Transport Act 1962, BW is the largest navigation authority in the country. Navigation on the Oxford Canal falls under the jurisdiction of BW.

APPENDIX B:
Results of Informal Liaison

APPENDIX B: Results of Informal Liaison

- B.1 During August 1994, all county, district and parish councils in the catchment were contacted, along with over 60 other organisations with an interest in the water environment within the catchment. The other organisations contacted included government departments and statutory bodies, conservation amenity and other interest groups, industries and other businesses located in the catchment, landowners and angling organisations.
- B.2 The purpose of this period of informal liaison was to secure relevant information and appreciation of the issues related to the water environment, concerning those associated with the area from as wide a range of local people, interest groups and statutory bodies as possible. This informal liaison exercise was not intended to be a substitute for the planned period of formal consultation. It enabled the NRA, however, to review a wide range of interests in the natural water environment, before identifying key issues to be addressed.
- B.3 The overall response rate from the exercise was 35%. However, as shown on the table below, the level of response varied between the different groupings of consultees.

Consultee Group	Number Contacted	Number Responding	% Response
A County and district councils	12	11	92
B Parish councils	102	21	21
C Government departments and statutory bodies	14	11	79
D Organisations and Interest Groups	40	13	33
E Industry	10	6	60
F Landowners and Angling Interests	4	2	50
Total	182	64	35

- B.4 Areas of concern varied widely and covered both generic and specific issues. However, certain issues attracted particular attention. The issues raised in the responses from the different groups of consultees were divided into three main categories:
- **Water Quality** - of surface and groundwater;
 - **Water Resources** - including water resource management, low flows and over-abstraction;

- **Physical Environment** - including conservation, landscape, amenity, the flooding and maintenance of watercourses and development pressures.

- B.5 Issues of concern to county and district councils primarily concerned development pressures on certain areas and the implications for water resources and water quality. The proposed extension of Boddington Reservoir was identified as an issue by several councils. In addition, concerns were raised over the preservation and enhancement of nature conservation and amenity resources throughout the catchment.
- B.6 Parish councils raised a far broader range of issues, which tended to be more area specific. In particular, localised flooding problems and the maintenance of watercourses were identified as an issue of concern. Existing and proposed development, including the M40, were highlighted as having implications for demand for water resources and increased urban run-off affecting water quality and sometimes causing flooding problems. Low flows on a number of watercourses, including the Cherwell, were raised as an area of concern, along with water level management on Otmoor. Another widespread concern was potential pollution from sewage treatment works and agricultural activities.
- B.7 Despite a relatively high response rate from Government Departments and Statutory Bodies, few organisations made detailed comments. However, two main areas of concern were identified. Environmental concerns were raised regarding the management of waterside habitats and the maintenance of good water quality. In addition the farming organisations expressed concern over the feasibility of future abstractions and restrictions imposed by any future tightening of pollution control legislation. The flooding of agricultural land in the catchment was also considered to be an issue.
- B.8 The interest groups which were contacted were primarily concerned with conservation and recreation, with the protection of Otmoor and the ESA designation, increased uptake of Countryside Stewardship schemes and the development of other conservation projects identified as key issues.
- B.9 Landowners and those with angling interests raised concerns over the low flows through Banbury and poor water quality below Bicester and Banbury STWs. Enhancements of the water environment and the creation of wetlands were identified as important issues. Some concern was also raised over development pressure within the catchment.

APPENDIX C:
Supporting Information

APPENDIX C1: Water Quality Chemical Standards

GQA Chemical Grading for Rivers and Canals

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

Notes:

⁽¹⁾ as suppressed by adding allyl thio-urea

⁽²⁾ ie. quality which does not meet the requirements of Grade E in respect of one or more determinands

Chemical Standards for River Ecosystem Classification

Class	Dissolved Oxygen % saturation	BOD (ATU) mg/l	Total Ammonia mg N/l	Un-ionised Ammonia mg N/l	pH ⁽¹⁾	Hardness mg/l Ca CO ₃	Dissolved Copper µg/l	Total Zinc µg/l
	10 percentile	90 percentile	90 percentile	95 percentile			95 percentile	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	30 200 300 500
RE4	50	8.0	2.5	-	6.0 - 9.0	≤10 >10 and ≤50 >50 and ≤100 >100	5 22 40 112	30 200 300 500
RE5	20	15.0	9.0	-	-	-	-	-

Note:

(1) Lower limit as 5 percentile; upper limit as 95 percentile

Table C2: BMWP Scores and Achievement of Predicted (1992/93 data)

Site	Location	BMWP Score	Achieves
Ashby Brook	At Blackbird Hill Farm	129	Y
Audley Brook	At Stratton Audley	46	N
Bletchington Brook	Above Gallos Brook	48	N
Bloxham Brook	Above Sor Brook	93	N
Boddington Canal Feeder	Claydon-Boddington Road	73	N
Byfield Brook	Below Byfield STW	44	N
Chacombe Brook	Above Cherwell, A361 Roadbridge	65	N
Cherwell	At water intake, Grimsbury	146	Y
Cherwell	Above Banbury STW	78	N
Cherwell	At roadbridge, Twyford	145	Y
Cherwell	At Heyford Bridge	185	Y
Cherwell	At Marston Road	160	Y
Croughton Brook	At A41 Roadbridge	123	Y
Culworth Brook	Above Cherwell	70	N
Deddington Brook	At Cold Harbour Farm, Deddington	73	N
Farnborough Ditch	College Farm Track	73	N
Farthinghoe Stream	Above Cherwell	80	N
Gallos Brook	Above Ray (Oxon) at Islip	110	Y
Gubbinshole Ditch	At Gubbinshole	34	N
Hanwell Brook	Above Oxford Canal, Hanwell	62	N
Highfurlong Brook	Above Cherwell, Cropredy	74	N
Hook Norton Brook	At Wigginton	61	N
Hornton Stream	At Horley	109	Y
Kings Sutton Stream	Below STW Kings Sutton	49	N
Langford Brook	At A41, Bicester	52	N
Langford Brook	Above Cutters Brook	40	N
Langford Brook	At A4095 Roadbridge	49	N
Ludgershall Brook	Above Ray, Ludgershall	47	N
Ockley Brook	Souldern Mill	125	Y
Oxon Ray	Arncott Bridge	48	N
Oxon Ray	Fencott Road Bridge	101	Y

Site	Location	BMWP Score	Achieves
Oxon Ray	At B4027 Islip	136	Y
Sor Brook	Above Cherwell at GS	115	N
Summerstown Ditch	Below Marsh Gibbon STW	27	N
Swere	Above Cherwell at Bloxham Bridge	167	Y
Techwick Brook	At A41(T)	50	N
Tramroad Ditch	Above Wooton, Wooton Underwood	46	N

NOTE:

- 1 Ludgershall Brook shows most recent 1991 data
- 2 Achieves predicted if observed BMWP, ASPT and number of taxa exceed River Invertebrate Prediction and Classification System (RIVPACS) predicted scores

**Table C3: Microbiological Surveillance of the River Cherwell Catchment 1991-1994
(including a Subjective Assessment of Levels of Bacterial Contamination)**

Watercourse	No. of Sites Sampled	No. of Samples					Problem Areas/Comments
		Total	Background Levels	Treated Sewage Present	Poorly Treated Sewage Present	Gross Faecal Contamination	
Cherwell	13	65	42	17	6	0	Highest levels of faecal bacteria recorded between Farndon Mill and Cropredy Bridge. Surface water abstraction site at Grimsbury Intake
Farthinghoe Stream	1	4	3	1	0	0	
Sor Brook	1	17	10	7	0	0	Surface water abstraction site at Bodicote Intake
Langford Brook	3	6	3	1	1	1	Wendlebury Crossing
Ray (Oxon)	3	10	6	4	0	0	
Grimsbury Reservoir	1	13	11	2	0	0	Standing water. Surface water abstraction site.

APPENDIX C4: Pollution Incident Categories

MAJOR

A major incident involving one or more of the following:

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

SIGNIFICANT

- notification to abstractors necessary;
- significant fish kill;
- measurable effect on invertebrate life;
- water unfit for stock;
- bed of watercourse contaminated;
- amenity value to the public, owners or users reduced by odour or appearance;
- 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.

APPENDIX C5: Prosecutions and Fines over the past Five Years

Name	Water Course	Location	Offence	Date of Incident	Date of Hearing	Fine £	Type of Pollution
Mrs J Clarke	Deddington Brook	Nether Worton	S.107(1)(a) WA 1989	20.02.91	21.05.91	250	Silage
Mr A Smith	Gallos Brook	Kirtlington	S.107(1)(a) WA 1989	05.04.91	30.09.91	900	Farm waste
Richard Linnell	Ashby Brook	Canons Ashby	S.85(1) WRA 1991	16.06.92	29.10.92	1,000	Slurry
Reape Bros. Contractors Ltd	Bloxham Brook	Bloxham	S.85(1) WRA 1991	08.10.92	21.10.93	2,500	Silt
Carmel Court Ltd.	Toll Brook	Bletchington	S.85(6) WRA 1991	09.10.92	14.10.93	3,500	Sewage effluent
Carmel Court Ltd.	Toll Brook	Bletchington	S.85(6) WRA 1991	15.12.92	14.10.93	3,500	Sewage effluent
Carmel Court Ltd.	Toll Brook	Bletchington	S.85(6) WRA 1991	26.01.93	14.10.93	3,500	Sewage effluent
Forte (UK) Ltd	Staplehurst Stream	Weston-on-the-Green	S.85(6) WRA 1991	27.05.93	25.02.94	2,000	Sewage effluent
Forte (UK) Ltd	Staplehurst Stream	Weston-on-the-Green	S.85(6) WRA 1991	05.08.93	25.02.94	2,000	Sewage effluent
Peter Cox	Launton Brook	Launton	S.85(1) WRA 1991	17.09.93	11.07.94	500	Dairy washings
Cherwell Valley Silos Ltd	River Cherwell	Twyford	S.85(1) WRA 1991	05.10.93	22.04.94	500	Citrus Pulp
Peter Cox	Launton Brook	Launton	S.85(1) WRA 1991	10.11.93	11.07.94	500	Slurry

APPENDIX C6: Policy Statements on Licensing Abstraction

Introduction

- C6.1 The abstraction of water is controlled by the Water Resources Act 1991. This summary presents the key policy statements contained in the General Statement of 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)

- C6.2 **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

- C6.3 **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 five or ten year intervals and some may be subject to control by a prescribed groundwater level.

Consumptive Abstractions from Unconfined Aquifers

- C6.4 **Policy G4:** Within 250 m of a perennial, groundwater-fed stretch of river or within its main floodplain, whichever is the greater, consumptive groundwater abstractions will be treated as abstractions from a river (see G2 above).
- C6.5 **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.
- C6.6 In some cases, some reservoir storage will be required to make such abstractions fully reliable.

Non Consumptive Abstractions

- C6.7 **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 ('Do Minimum')

- C6.8 **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 5,000 m³ (1.1 million gallons) per year and 20 m³ (4,400) gallons per day.

Abstractions for Spray Irrigation

- C6.9 **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.
- C6.10 **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.
- C6.11 **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

- C6.12 **Policy G11:** Abstractions from the tideway of the River Thames will normally be permitted, providing there is no conflict with water quality and fisheries.
- C6.13 **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.

**APPENDIX C7: Target Standards of Service for the River Cherwell
SOS Reaches: Cherwell District**

River No.	Reach No.	Downstream Name	Upstream Name	Reach Length	LUB	LOS
0185/08	1	River Ray	MRL	1.057	D	E
0183/13	1	River Cherwell	MRL	7.643	E	E
0185/07	1	River Ray	N/S Arm - Cross	3.961	E	E
0189/03	1	Langford Brook	MRL	1.023	E	E
0183/04	1	County Bridge Loop	MRL	3.010	D	E
0184/00	1	Sescut Farm Loop	MRL	4.979	E	E
0200/00	1	Sor Brook	MRL	4.250	E	E
0192/01	1	Old River Ray	MRL	4.846	D	E
0203/07	1	Highfurlong Brook	MRL	0.150	E	E
0185/13	1	River Ray	Summerstown Ditch	2.436	E	E
0183/11	1	River Cherwell	MRL	4.730	C	E
0183/07	1	River Cherwell	MRL	3.317	E	E
0197/00	1	River Cherwell	Ilbury Bridge	4.979	E	E
0197/00	2	Ilbury Bridge	MRL	4.485	E	E
0185/01	1	River Ray	Gallos Brook	2.084	E	E
0203/03	1	Wormleighton Brook	MRL	1.200	E	E
0203/04	1	Wormleighton Brook	MRL	2.227	E	E
0191/00	1	River Ray	MRL	6.108	E	A
0201/03	1	Thenford Brook	MRL	1.278	E	E
0203/00	1	River Cherwell	Welsh Road	7.347	E	A
0203/00	2	Welsh Road	MRL	6.685	E	E
0202/00	2	Footbridge	MRL	7.452	E	E
0202/00	1	Oxford Canal	Footbridge	4.473	D	E
0188/03	1	Tetchwick Brook	MRL	1.080	E	E
0185/02	1	River Ray	MRL	6.089	E	E
0201/00	2	A422	MRL	3.574	E	E
0201/00	1	River Cherwell	A422	5.365	C	E
0188/06	1	Tetchwick Brook	MRL	3.222	E	E
0193/05	1	Murcott Dike	MRL	2.067	D	E
0183A/00	2	Cherwell Bridge	Railway	6.377	D	I

**APPENDIX C7: Target Standards of Service for the River Cherwell
SOS Reaches: Cherwell District (Contd.)**

River No.	Reach No.	Downstream Name	Upstream Name	Reach Length	LUB	LOS
0183A/00	4	Thrupp Bridge	Old Whitehall FM	6.758	D	E
0183A/00	5	Old Whitehall FM	Heyford Bridge	7.803	E	A
0183B/00	6	Heyford Bridge	Track	5.525	E	A
0183B/00	7	Track	County Bridge	6.485	E	I
0183B/00	9	Railway Bridge	Footpath	5.857	E	A
0183B/00	11	Lasher	Cropredy Bridge	5.603	E	E
0183B/00	12	Cropredy Bridge	Footpath	5.411	C	A
0183B/00	13	Footpath	Footbridge	6.840	E	E
0183B/00	14	Footbridge	Roadway to Byfield	5.382	D	E
0183B/00	15	Roadway to Byfield	MRL	3.827	C	E
0185/14	1	River Ray	MRL	1.267	E	E
0189/00	1	River Ray	Footpath	3.423	D	E
0189/00	2	Footpath	A41(T)	3.499	C	E
0189/00	3	A41(T)	MRL	4.967	D	E
0191/03	1	Cutters Brook	MRL	2.052	D	E
0185/09	1	River Ray	MRL	3.522	E	E
0183/01	1	River Cherwell	MRL	1.069	C	E
0194/01	1	Otmoor Inner Circle Dike FB	MRL	3.932	D	E
0185/05	1	River Ray	MRL	4.800	E	E
0185/11	1	River Ray	MRL	5.452	C	E
0183/08	1	Charlton Brook	MRL	0.470	E	E
0183/06	1	River Cherwell	MRL	1.604	E	E
0193/00	1	River Ray	Panshill Brook	3.299	D	E
0201/04	1	Farthinghoe Brook	MRL	3.708	E	E
0201/01	1	Farthinghoe Stream	MRL	1.980	D	E
0190/00	1	Cutters Brook	MRL	1.681	D	E
0186/02	1	Gubbinshole Ditch	MRL	2.647	E	E
0185/12	1	River Ray	MRL	6.139	D	E
0198/00	1	River Cherwell	Footbridge	7.246	D	E

**APPENDIX C7: Target Standards of Service for the River Cherwell
SOS Reaches: Cherwell District (Contd.)**

River No.	Reach No.	Downstream Name	Upstream Name	Reach Length	LUB	LOS
0198/00	2	Footbridge	A361	5.606	D	E
0198/00	3	A361	MRL	4.227	E	E
0190/02	1	Cutters Brook	Broadmoor Ditch	2.200	D	E
0188/00	1	River Ray	Kingswood Lane	4.335	C	A
0188/00	2	Kingswood Lane	MRL	6.192	E	E
0192/02	1	Beckley Brook	MRL	1.907	E	E
0185/06	1	River Ray	MRL	1.106	D	E
0185/04	1	Toll Brook	MRL	2.094	D	E
0185/00	1	River Cherwell	Fencott Bridge	6.168	C	I
0185/00	2	Fencott Bridge	Arncott Bridge	5.722	E	A
0185/00	3	Arncott Bridge	Three Points	7.963	D	I
0185/00	4	Three Points	Bridleway/Footpath	4.796	E	E
0185/00	5	Bridleway/Footpath	MRL	6.426	E	E
0199/00	3	Roadway (Broughton)	Roadway (Horley)	6.895	D	E
0199/00	4	Roadway (Horley)	MRL	5.895	E	E
0188/04	1	Tetchwick Brook	Footpath	3.656	E	E
0183/03	1	River Cherwell	MRL	2.113	E	E
0183/15	1	River Cherwell	MRL	1.744	E	E
0189/02	1	Langford Brook	MRL	2.104	C	E
0201/02	1	Farthinghoe Stream	MRL	4.347	E	E
0188/05	1	Wootten Brook	MRL	2.873	E	E
0185/03	1	Gallos Brook	MRL	2.882	E	E
0203/02	1	Highfurlong Brook	MRL	1.208	E	E
0193/09	1	Marlake Ditch	Field Road Ditch	2.636	E	E
0191/01	1	Cutters Brook	Beaconhill Ditch	4.345	E	E
0186/00	1	River Ray	Gubbinshole Ditch	5.408	E	E
0193/02	1	Murcott Dike	Fencott Ditch	4.310	E	E
0188/01	1	Tetchwick Brook	MRL	1.368	E	E
0203/01	1	Highfurlong Brook	Oathill Ditches Main	1.776	E	E

**APPENDIX C7: Target Standards of Service for the River Cherwell
SOS Reaches: Cherwell District (Contd.)**

River No.	Reach No.	Downstream Name	Upstream Name	Reach Length	LUB	LOS
0193/06	1	Murcott Dike	Marlake MRL	4.753	D	E
0190/01	1	Cutters Brook	MRL	0.781	E	E
0185/15	1	River Ray	Muxwell Brook	3.428	E	E
0203/06	1	Highfurlong Brook	Main - MRL	1.577	E	E
0183/02	1	River Cherwell	MRL	1.496	D	E
0199/00	1	River Cherwell	Roadway	7.440	D	E
0199/00	2	Roadway	Roadway (Broughton)	6.853	C	E
0183B/00	8	County Bridge	Railway Bridge	5.638	E	A
0183A/00	3	Railway	Thrupp Bridge	7.005	D	I
0183A/00	1	Thames-Sandford Reach	Cherwell Bridge	6.644	C	A
0183B/00	10	Footpath	Lasher	6.729	C	E
0183/12	1	River Cherwell	MRL	1.412	D	E
0183/10c	1	Chalcombe Road Ditches (Main)	MRL	0.630	E	E

APPENDIX D:

Glossary

GLOSSARY

<i>Abstraction</i>	Removal of water from surface or groundwater, usually by pumping.
<i>Abstraction Licence</i>	Licence issued by the NRA under S38 of the Water Resources Act 1991 to permit water to be abstracted. The maximum abstraction rates are specified in the licence.
<i>AOD</i>	Above Ordnance Datum
<i>AONB</i>	Area of Outstanding Natural Beauty (designated by the Countryside Commission)
<i>Aquifer</i>	A rock formation containing water in recoverable quantities.
<i>Baseflow</i>	That part of the flow in a watercourse made up of groundwater and discharges.
<i>Biochemical Oxygen Demand (BOD)</i>	A measure of the amount of oxygen consumed in water, usually as a result of organic pollution.
<i>BPEO</i>	Best Practicable Environmental Option
<i>BS7750</i>	British Standard covering the production and implementation of Environmental Management Systems
<i>Catchment</i>	Area from which water runs off to any given river valley.
<i>Confluence</i>	The point at which two rivers meet.
<i>Consent</i>	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.

<i>Countryside Stewardship Scheme</i>	Scheme set up by the Countryside Commission in which landowners are grant aided to manage their land in an environmentally sensitive manner.
<i>County Structure Plans</i>	Statutory documents produced by County Councils outlining their strategy for development over a 10-15 year timescale.
<i>CMP</i>	Catchment Management Plan - integrated plans for the catchment which cover all the functions of the NRA. These provide the strategy by which the catchments will be managed.
<i>Cyprinids</i>	Coarse fish of the Carp family ie. roach, dace, bream.
<i>Dangerous Substances</i>	Substances defined by the European Commission as in need of special control because of their toxicity, bioaccumulation or persistence. The substances are classified as List I or List II according to the Dangerous Substances Directive.
<i>Dissolved Oxygen (DO)</i>	The amount of oxygen dissolved in water. Oxygen is vital for life so this measurement is an important, but highly variable, indicator of the 'health' of the water. It is used to classify waters.
<i>Diffuse pollution</i>	Pollution without a single point source eg. acid rain, pesticides, urban run-off, etc.
<i>Directive</i>	Legislation issued by the European Community which is binding on the member states.
<i>District Local Plans</i>	Statutory documents produced by District or Borough Councils to implement the development strategy set out in County Structure Plans. Specific land use allocations are identified.
<i>DoE</i>	Department of the Environment
<i>DTp</i>	Department of Transport
<i>EA</i>	Environmental Assessment

<i>Floodplain</i>	Land adjacent to a watercourse covered by water in times of flood.
<i>Geomorphology</i>	The study and science of landforms and the processes that form them.
<i>GIS</i>	Geographical Information System
<i>Groundwater</i>	Water contained in the pores and fissures of aquifers (water bearing strata).
<i>Hydrometric</i>	Measurement of hydrological entities.
<i>Invertebrate fauna</i>	Animals which lack a vertebral column - used for biological classification. Especially macro-invertebrates (animals of sufficient size to be retained in a net with a specified mesh size).
<i>Landfill</i>	Site used for waste disposal into/onto land.
<i>Macrophytes</i>	Emergent aquatic plants.
<i>MAFF</i>	Ministry of Agriculture, Fisheries and Food.
<i>Main River</i>	Some, but not all, watercourses are designated as 'Main River'. 'Main River' status of a watercourse must first be approved by MAFF. The NRA has the power to carry out works to improve drainage or protect land and property against flooding on watercourses designated as 'Main River'.
<i>NRA-TR</i>	National Rivers Authority (Thames Region)
<i>Operational Investigation</i>	A regionally funded research project (particular to the NRA)
<i>Potable water</i>	Water suitable for human consumption.
<i>Riparian Owner</i>	A person/organisation with property rights on a river bank.

<i>River Corridor</i>	Land adjacent to a watercourse with visual, physical or ecological links to it.
<i>River Quality Objective (RQO)</i>	The level of water quality that a river should achieve in order to be suitable for agreed uses.
<i>Salmonids</i>	Fish classified as belonging to the Salmon family ie. salmon, trout, char etc.
<i>Septic Tank</i>	A small tank receiving and treating sewage by bacteria.
<i>Set-aside</i>	Land temporarily withdrawn from of agricultural production. Grant aided by MAFF.
<i>Silage</i>	A winter feed for cattle. Silage is produced in the summer by bacterial action on freshly cut grass.
<i>Site of Special Scientific Interest (SSSI)</i>	A site given a statutory designation by English Nature as a result of its nature conservation or geological value.
<i>Sludge</i>	The accumulation of solids from the sewage treatment process. Sludge can be incinerated or spread on farm land.
<i>Slurry</i>	Animal waste in liquid form.
<i>Source Control</i>	A collective term to describe the management of run-off at or near the point of impact of rainfall and before it reaches the piped drainage and sewer systems of urban areas (see <i>Swale</i>).
<i>Springs</i>	Natural emergence of groundwater at the surface.
<i>STW</i>	Sewage Treatment Works
<i>Swale</i>	An example of Source Control attenuation, they are grass channels used to convey and treat run-off. Others include balancing ponds, permeable pavements and underground water butts.

<i>Statutory Water Quality Objectives (SWQOs)</i>	Water quality objectives set by the Secretary of State, in relation to controlled waters.
<i>Sustainable</i>	Capable of being maintained at a steady state without exhausting natural resources or causing ecological damage.
<i>Sustainable Development</i>	Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.
<i>Topography</i>	Physical features of a geographical area.
<i>Transpiration</i>	Loss of water through evaporation by plants
<i>Turbidity</i>	Measure of the light scattering properties of the water caused by suspended matter.
<i>Watercourse</i>	A stream, river, canal or channel along which water flows.

Acronyms

AMP	Asset Management Plan
AOD	Above Ordnance Datum
AONB	Area of Outstanding Natural Beauty
ASPT	Average Score Per Taxa
BBONT	Buckinghamshire, Berkshire and Oxfordshire Naturalist Trust
BC	Borough Council
BMWP	Biological Monitoring Working Party
BOD	Biochemical Oxygen Demand
BWB	British Waterways Board
CC	County Council
CMP	Catchment Management Plan
CTR	County Trust Reserves
DC	District Council
DoE	Department of the Environment
DO	Dissolved Oxygen

DTp	Department of Transport
DWI	Drinking Water Inspectorate
<i>E. coli</i>	<i>Eshericia Coli</i>
EC	European Commission
ESA	Environmentally Sensitive Area
FWAG	Farming and Wildlife Advisory Group
GQA	General Quality Assessment
HMIP	Her Majesty's Inspectorate of Pollution
LNR	Local Nature Reserve
MAFF	Ministry of Agriculture, Fisheries and Food
ML	Megalitre
MoD	Ministry of Defence
MRL	Main River Limit
NNR	National Nature Reserve
NRA	National Rivers Authority
NRA TR	National Rivers Authority Thames Region
NVZ	Nitrate Vulnerable Zone
NWC	National Water Council
OFWAT	Office of Water Services
OI	Operational Investigation
RE	River Ecosystem
RIVPACS	River Invertebrate Prediction and Classification Scheme
RQO	River Quality Objective
SLA	Special Landscape Area
SNCI	Site of Nature Conservation Importance
SoS	Standards of Service
SSSI	Site of Special Scientific Interest
STW	Sewage Treatment Works
SWQO	Statutory Water Quality Objective
TWUL	Thames Water Utilities Limited
UWWD	Urban Waste Water Treatment Directive
WQO	Water Quality Objective

Units

Length:	10 mm = 1 cm (equivalent to 0.394 inches)
	100 cm = 1 m (equivalent to 39.37 inches)

1000 m = 1 km (equivalent to 0.621 miles)

Area: 10,000 m² = 1 ha (equivalent to 2.47 acres)

Flow: 1,000 l/s = 1 m³/s (equivalent to 35.31 cusecs)
1,000 m³/d = 11.6 l/s (equivalent to 0.41 cusecs)
1 MI/d = 11.6 l/s (equivalent to 0.41 cusecs)

Volume: 1 MI = 1,000 m³