

UPPER THAMES CATCHMENT MANAGEMENT PLAN CONSULTATION REPORT



NRA

National Rivers Authority

Thames Region

January 1995

This consultation report is the first stage of the catchment management planning for the Upper Thames and we would appreciate to hear your views:

Have we identified all the major issues?

Have we identified all the practical solutions?

Have you any comments on the appearance and contents of the report?

PLEASE NOTE: WHILST EVERY EFFORT HAS BEEN MADE TO ENSURE THE ACCURACY OF THIS REPORT, IT MAY STILL CONTAIN SOME ERRORS OR OMISSIONS UPON WHICH WE WILL BE PLEASED TO RECEIVE YOUR COMMENTS.

To comment on this document, please:

1. Complete the response questionnaires I and II, and/or;
2. Write to;

Mr J A Hamid

**Upper Thames Catchment Management Plan
National Rivers Authority - Thames Region
West Area
Isis House
Howbery Park
Wallingford
Oxon OX10 8BD**

Further copies are available (Price £25 for non-consultees) - please contact the above for an order form.

All comments must be with us by **31 March 1995**.



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Upper Thames Catchment Management Plan

Consultation Report

National Rivers Authority

Thames Region - West Area

Isis House

Howbery Park

Wallingford

Oxon OX10 8BD

January 1995

ENVIRONMENT AGENCY



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Foreword

As “Guardians of the Water Environment” we are committed to preparing sound and thorough plans for the future management of the Region’s rivers, groundwaters and waterbodies.

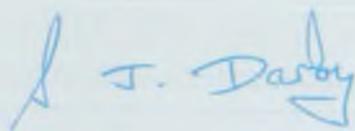
This Consultation Report constitutes the second catchment to be tackled by the West Area of the National Rivers Authority (NRA) Thames Region.

We see the development of Catchment Management Plans as a way of establishing the important requirements in each river catchment. By open public consultation with those who have an interest in a sustainable water environment, we hope to achieve a broad consensus on the major issues, and obtain the commitment of those who will need to be in partnership with us in their resolution.

This report is offered for consultation and comment after which a Final Report, detailing proposed actions, will be produced. The report identifies the current uses, values and status of the water environment in the Upper Thames catchment. We have examined NRA information on the catchment along with the results of the informal consultation exercise and identified in the report what we consider to be the main issues.

The Upper Thames Catchment Management Plan and subsequent plans for other river catchments in the West Area will represent a shared vision for the future and play a key role in the protection of our water heritage whilst recognising the ever competing pressures on the river environment.

We look forward to receiving the contributions of all organisations and individuals involved with the river and its catchment.



Stuart Darby
Area Manager
NRA Thames Region (West Area)

UPPER THAMES CATCHMENT MANAGEMENT PLAN : CONSULTATION REPORT

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Acknowledgements

(i) All those organisations, groups and individuals who responded to the NRA during the period of informal liaison.

(ii) Various local authorities and Ordnance Survey on whose maps some of the information shown on the synoptic maps is based.

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Please Note:

The grid references used on the maps differ from those given in the text through the use of "SU" in the latter. For conversion, the first digit of the Easting and Northing can be replaced by the relevant letter as follows;

S	U	S	O	S	P	S	T
4	1	3	2	4	2	3	1

eg OS system SU390271 is equivalent to 439127 (within the grid coordinates of 430000 and 120000). The use of grid letters to divide up Great Britain was devised by Ordnance Survey to ease location. For greater accuracy six figure grid references are then utilised. Alternatively, a purely numerical system can be adopted ie digitally for GIS purposes.

THE DRAFT VISION - UPPER THAMES 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 it is something that we can all work towards.

The Upper Thames is a precious part of our national heritage. It lies mainly within the counties of Gloucestershire and Wiltshire, with a small part of Oxfordshire in the South-East corner also included. It covers the complete length of the River Thames upstream of Buscot lock and 11 major tributaries join the river in this section. The area is predominantly rural, although the urban settlement of Swindon dominates the southern half.

The Upper Thames and its tributaries, together with other water bodies within the catchment, are valuable as fisheries and for wildlife conservation, as a source of water for potable supply and as a resource extensively used for recreation and navigation. While the Cotswold Hills display a unique landscape character and appeal projected by the limestones which were for centuries used as the universal building stone of the area, the Cotswold Water Park provides over 5000 hectares of water-related activities including conservation, angling and boating. The lakes of the Park also provide flood attenuation and storage.

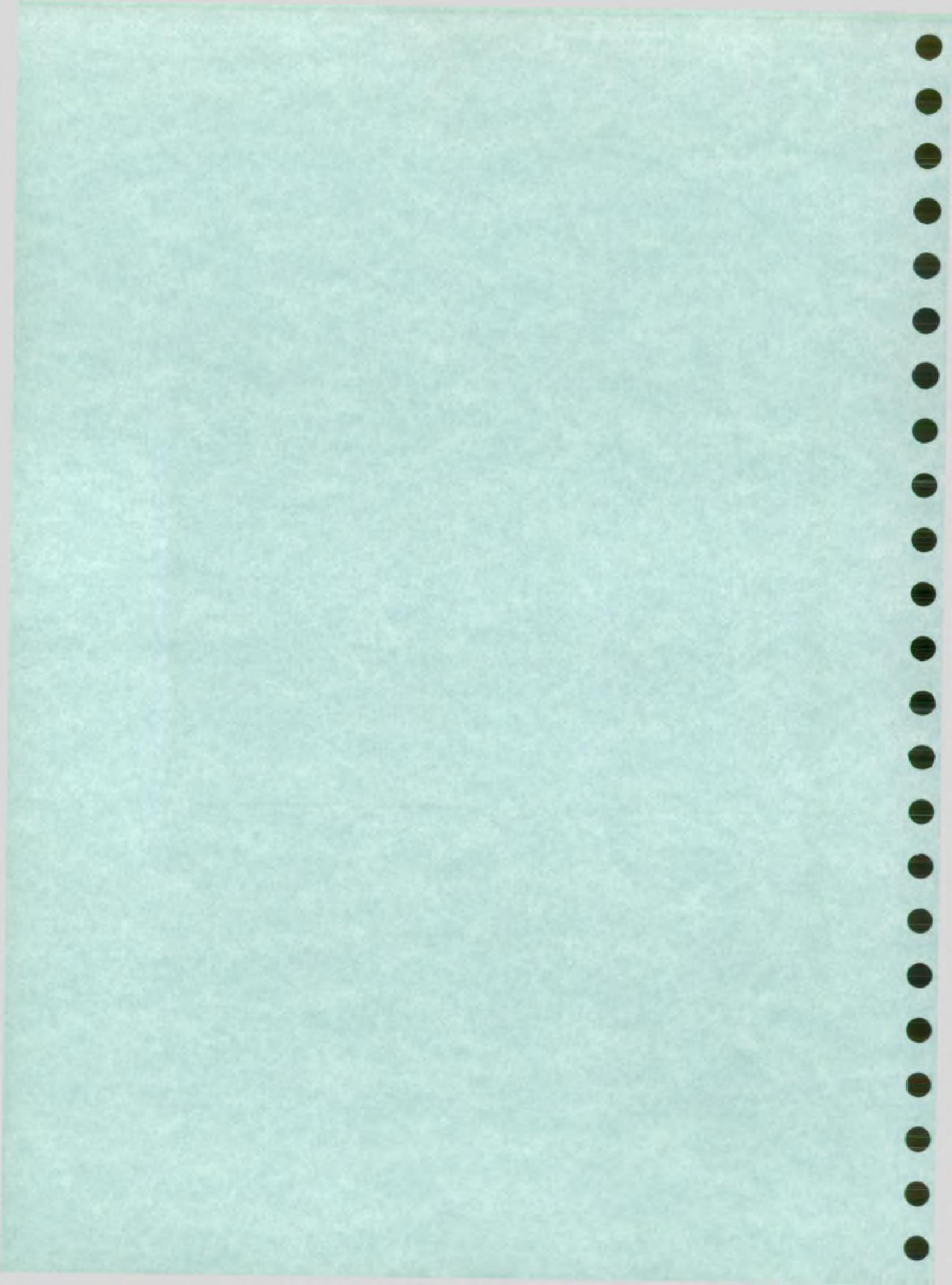
Development pressure will continue to be a perceived threat, particularly from mineral extraction, road and bypass proposals and water transfer schemes, not only in terms of impact on local residents but also on flood risk and environmental grounds.

To realise the potential value and optimise the use of the water environment, the NRA will work in partnership with local authorities, environmental groups, and other interested agencies. The Upper Thames CMP will provide an important focus for this partnership. Our aim is not only to maintain the existing values of the catchment, but also to:

- a) improve the landscape and conservation value of the water environment where opportunities exist;*
- b) improve access, information and visitor facilities for water-based recreation where this is sustainable, ie, where there will not be a detrimental effect upon the environment;*
- c) alleviate local riverside flooding where properties may be affected;*
- d) maintain, improve and develop fish stocks in order to optimise the environmental and social benefits from their sustainable utilisation;*
- e) protect and improve the water quality;*
- f) recognise and protect the strategic importance of the Thames Path National Trail;*
- g) ensure water resources are not only well-managed but developed in a sustainable manner which does not adversely affect river flows; and,*
- h) contribute to the management of the Cotswold Water Park area in providing planning advice and resources to monitor its effective implementation and to ensure that areas of value are conserved, and those which have become degraded are enhanced.*

SECTION 1

INTRODUCTION



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 water resources, pollution control, flood defence, fisheries, recreation, conservation and navigation in England and Wales. 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.
- 1.2 The NRA is funded through a variety of charges, for example, water abstraction charges, effluent discharge charges, rod licence fees, navigation licence fees etc, as well as through government grants from the Department of the Environment (DoE), Ministry of Agriculture, Fisheries and Food (MAFF), and Welsh Office (WO).
- 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, groundwaters, 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 the region's river catchments. A Catchment Management Plan (CMP) identifies the existing values of the catchment and the key issues and problems. Action plans are then outlined in order to preserve these values and to address these issues and problems. This Consultation Report phase of the CMP is a step towards achieving that goal for the Upper Thames catchment, which lies within the West Area of the NRA's Thames Region (NRA-TR).

CATCHMENT MANAGEMENT PLANNING

- 1.5 The water environment, eg, rivers, streams, lakes, ponds, aquifers, springs, etc, is subject to a wide variety of uses which invariably interact and sometimes conflict with each other. The catchment management planning process has been developed to help manage all water-based interests within individual catchment areas and any interactions or conflicts between them for the overall benefit of the water environment and its users.
- 1.6 Although the NRA has a pivotal role to play in the management of the water environment, the catchment management planning process recognises that a partnership approach between the NRA and others is essential. Consequently, this report has been produced as a means of progressing detailed consultation with all interested parties.
- 1.7 CMPs are intended to produce a framework for advising on development plan policies including issues such as water and sewerage infrastructure, floodplain protection, waste disposal etc. It is hoped, therefore, that Planning Authorities will give due regard to CMPs when formulating development plan policy.

- 1.8 Although each section of this document contains its own introduction, in summary the report comprises of:
- description of the relevant natural features of the catchment (Section 2);
 - description of the actual and potential uses and resources, eg, water abstraction, navigation, and flood defence, of the catchment and draft environmental objectives for the conservation and enhancement of these uses (Section 3);
 - description of the current status of the catchment in relation to the key characteristics of water quality, water resources and physical features (Section 4); and,
 - presentation of 'catchment'-specific issues (Section 5).
- 1.9 Within each section synoptic maps are used to complement and enhance the text and to illustrate relevant features.
- 1.10 To assist in the preparation of this plan, a range of organisations and groups were contacted during April and May 1994. The results of this informal liaison are summarised in Appendix A.
- 1.11 The purpose of the consultation phase is to:
- consolidate and confirm the range and extent of catchment uses;
 - obtain views on the (relative importance of) issues facing the water environment; and,
 - begin the process of identifying and implementing action plans.
- 1.12 This document is, therefore, part of a process that will enable a shared vision of the catchment to be developed which will guide all NRA activities for the next five to ten years. This vision and its supporting strategies will be presented in the CMP 'Final Report'. The timetable for completing this report is currently Autumn 1995. Regular monitoring and updating of the plan will be an integral part of the process, ie, the production of an annual progress report and a repeat of the process every five years.
- 1.13 The NRA welcomes comments on the document. Details of the consultation process and the overall programme are given in Section 6.

SECTION 2

CATCHMENT DESCRIPTION

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.

2.2 The boundary of the Upper Thames catchment includes all land which drains to the Upper Thames extending to and upstream of Buscot Lock together with its tributaries including the Rivers Churn, Coln, Ray, Key, Cole, Leach, and the Swill and Ampney Brooks (see Figure 1).

2.3 The key statistics of the catchment are:

- Catchment Area : 994 km²;
- Population (1991 estimate): 230,000,
Major towns: Swindon, Cirencester;
- Average Annual (1941-70) Rainfall : 770 mm;
- Main River Length: 337 km (maintained by NRA for flood defence purposes).

OVERVIEW OF THE CATCHMENT

2.4 The total length of the River Thames covered in this plan is 31.5 km with a catchment area of approximately 1000 km², which represents about 9% of Thames Region's total catchment area.

2.5 The area identified in this plan as the Upper Thames lies mainly within the counties of Gloucestershire and Wiltshire, with a small part of Oxfordshire in the south east. It covers the complete length of the River Thames upstream of Buscot Lock and its tributaries, as follows:

- River Leach;
- River Coln;
- Marston Meysey Brook;
- Ampney Brook;
- River Churn;
- Swill Brook;
- River Key;
- River Ray;
- Share Ditch;
- Bydemill Brook;
- River Cole.

- 2.6 The catchment can be divided along the River Thames with all the tributaries to the north rising from the Cotswolds and fed by springs, while those to the south are associated largely with clay catchments or the urban conurbation of Swindon.
- 2.7 Water quality in the Upper Thames catchment ranges from 'good' to 'bad' (see Section 4, Figure 21). The highest quality is to be found in Cotswold rivers such as the Churn and the Coln, whereas a lower quality is to be found in the Ray and some of the smaller brooks and ditches.
- 2.8 The area is predominantly rural with the Cotswolds, an Area of Outstanding Natural Beauty (AONB), occupying the northern half. However, the settlement of Swindon (population 150,000) dominates the southern half. Other settlements include Cirencester, Wroughton, Cricklade and Highworth.
- 2.9 The area is skirted along its southern boundary by the M4 motorway and the A40 trunk road crosses in the north. The remains of the Thames and Severn Canal can be found from Lechlade to the west, and further south are the fragmented remnants of the Wiltshire and Berkshire Canal and the North Wiltshire Branch Canal (see Figure 12).
- 2.10 The Cotswold Water Park, currently split into an eastern and western section, also lies within the Plan area. It is the largest concentration of gravel pits and associated land in Great Britain, and covers some 5,700 hectares of which almost 1,000 hectares is open water in the form of approximately 120 man-made lakes. The Park straddles the boundary between Gloucestershire and Wiltshire and includes parts of the Cotswold and North Wiltshire Districts.

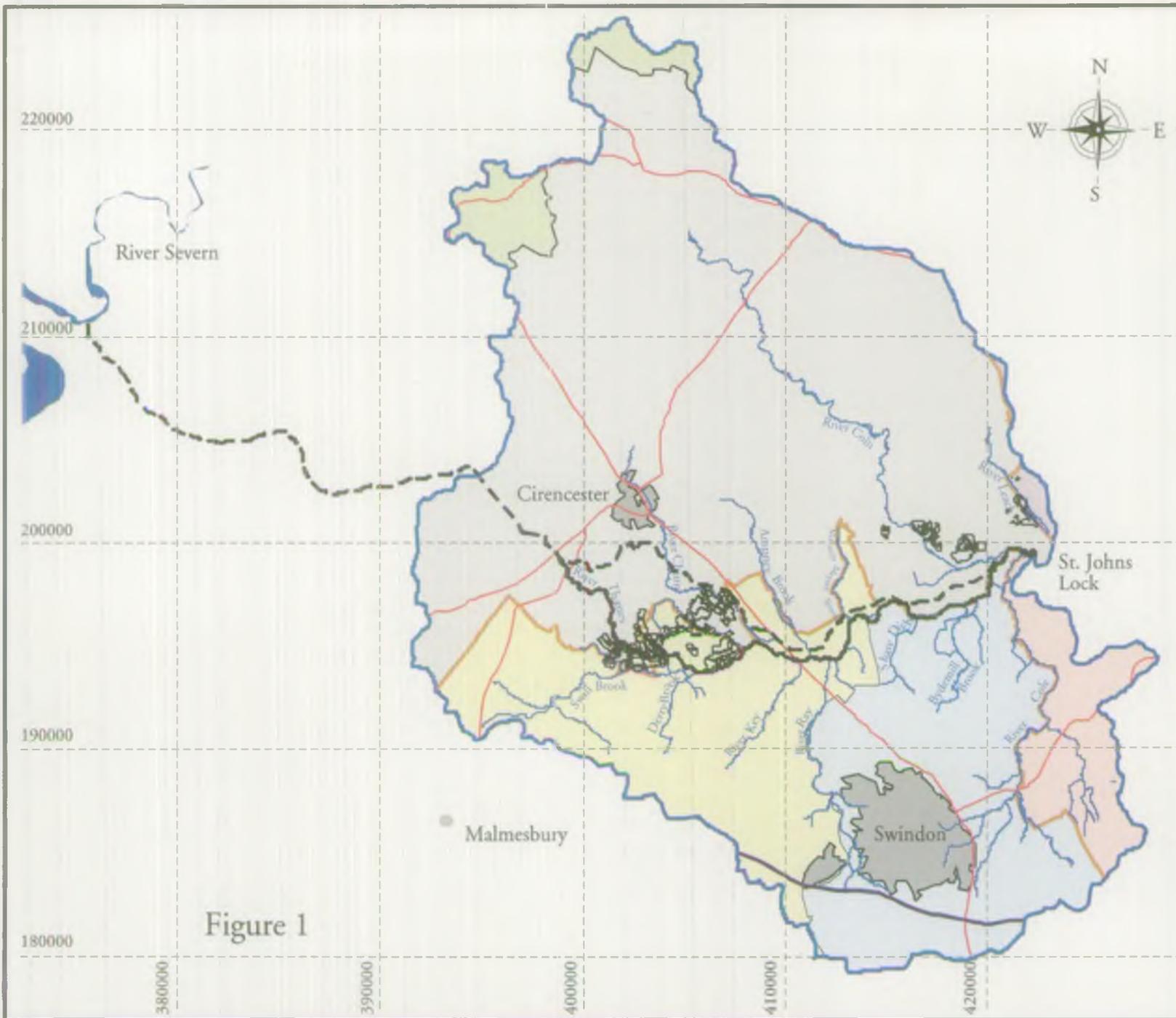


Figure 1

Upper Thames CMP:

Overview

Local Authority

- Cotswold
- Thamesdown
- West Oxfordshire
- Vale of White Horse
- North Wiltshire
- Tewkesbury
- Urban Areas
- Lock
- County Boundaries
- Motorway
- Primary 'A' Roads
- Main Rivers & Water Bodies
- River Thames
- CMP Boundary
- Thames-Severn Canal Route

Scale:-

10km



NRA

National Rivers Authority
Thames Region

TOPOGRAPHY

- 2.11 The Upper Thames catchment drains from the Marlborough Downs in the south and the Cotswold Hills to the north. The Marlborough Downs form an escarpment in the south east corner of the catchment and reach a height of 277 m Above Ordnance Datum (AOD) (see Figure 2) at Liddington Castle.
- 2.12 The Cotswold Hills form the northern section of the catchment between the towns of Cheltenham, Cirencester and Northleach. The highest point in the catchment which exceeds 320 m AOD, lies within the Cotswold Hills to the north of Cirencester.

Table 2.1 - Key Features of the Main Tributaries

River	Area (km ²)	Topography/ Geology	Comments/Key Features
Churn	132	Cotswolds, steep sided valleys; Limestone	A spring-fed river. Middle and lower reaches are influenced by the Cirencester urban area. A number of mills and weirs have affected the channel.
Ray	84	Rolling hills; Clay	Catchment is strongly influenced by the Swindon urban area.
Ampney Brook	76	Lower Cotswolds; Limestone	A small, spring-fed brook.
Coln	177	Cotswolds, steep sided valleys; Limestone	A spring-fed river. Very little urban development in the catchment.
Cole	141	Rolling hills; Clay	Fed by largely surface run-off. Influenced by the Swindon urban area.
Leach	78	Lower Cotswolds; Limestone	A spring-fed river. Ephemeral (ie dries up) over its middle reaches.

- 2.13 The main rivers in the catchment drain from the north and south to the Thames Valley in the centre. The River Thames rises from its source at Thames Head in the west and falls nearly 50 metres before leaving the catchment at Lechlade. The Thames is confluent with the Leach and Coln at Lechlade. The River Cole is bifurcated with the 'old' channel joining upstream of Inglesham and the new channel confluent at Lechlade.

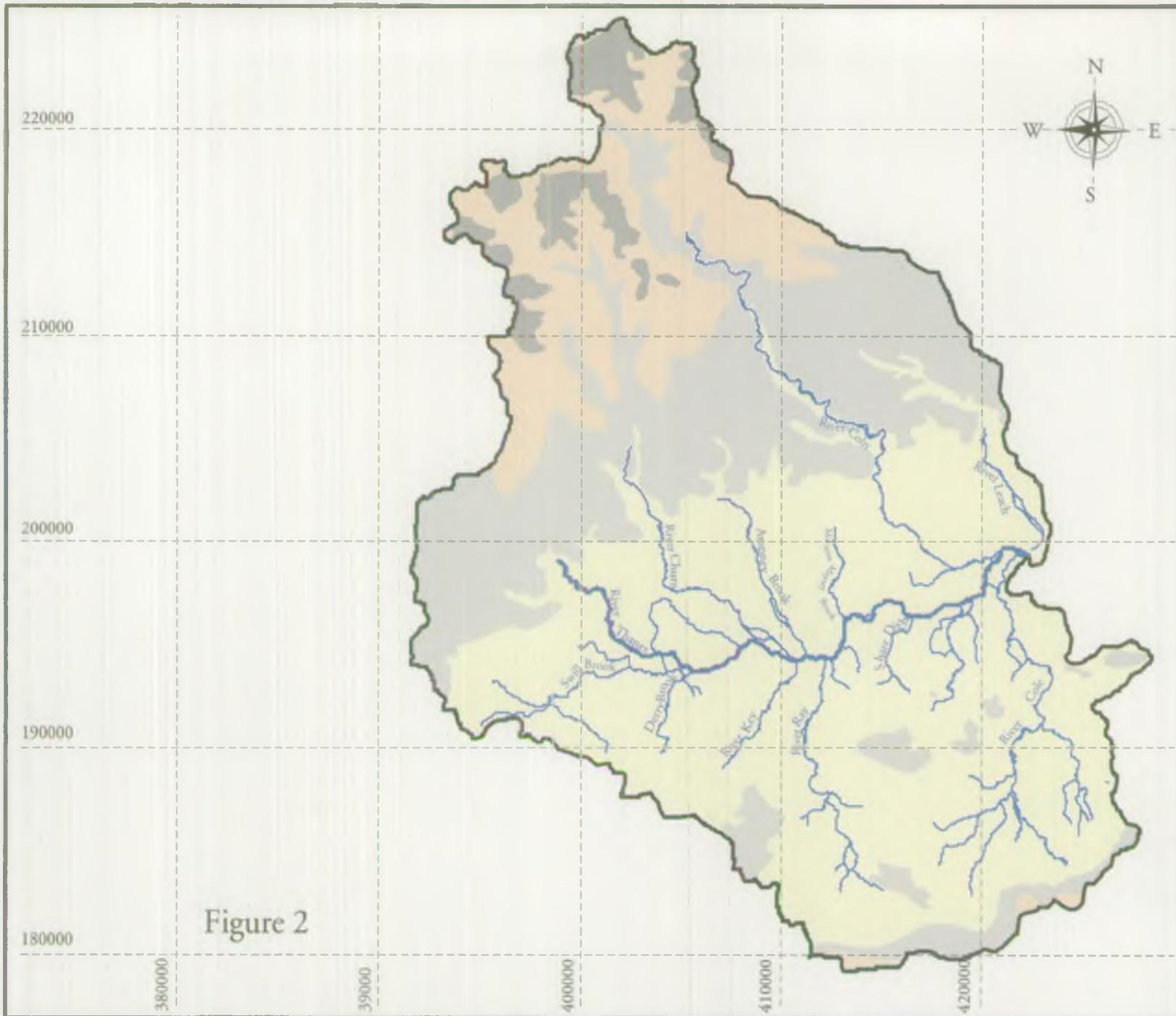


Figure 2

Upper Thames CMP:

Topography

-  CMP Boundary
-  River Thames
-  Main River

Height Above Ordnance Datum (Newlyn) in Metres

-  305 - 427
-  245 - 305
-  184 - 244
-  123 - 183
-  62 - 122
-  0 - 61

Scale:-

10km



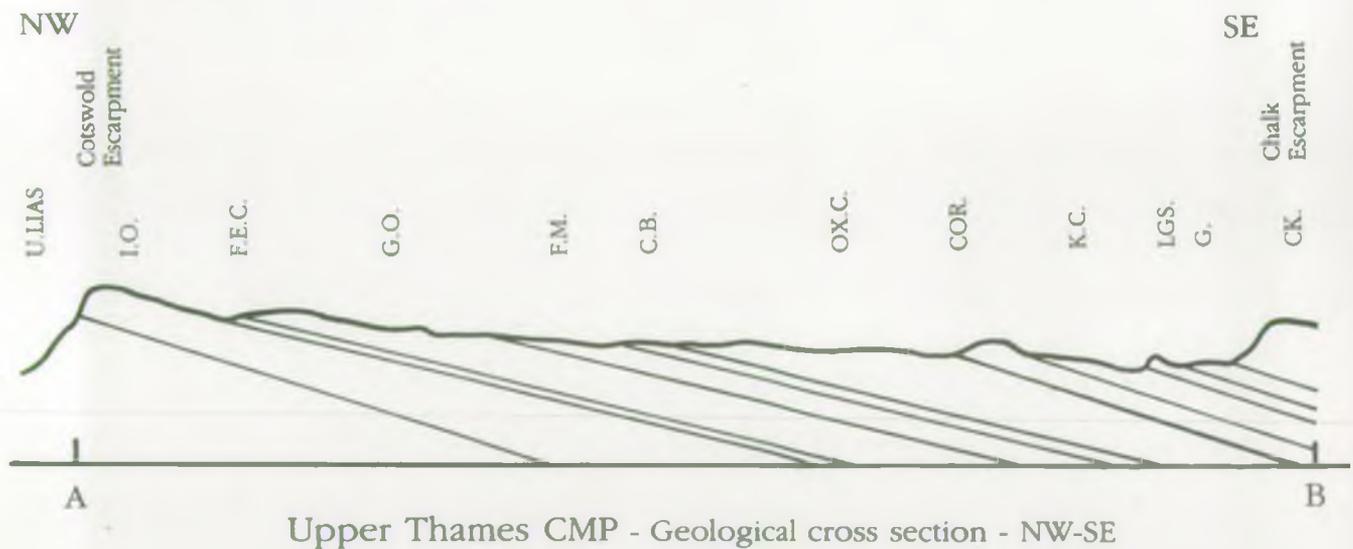
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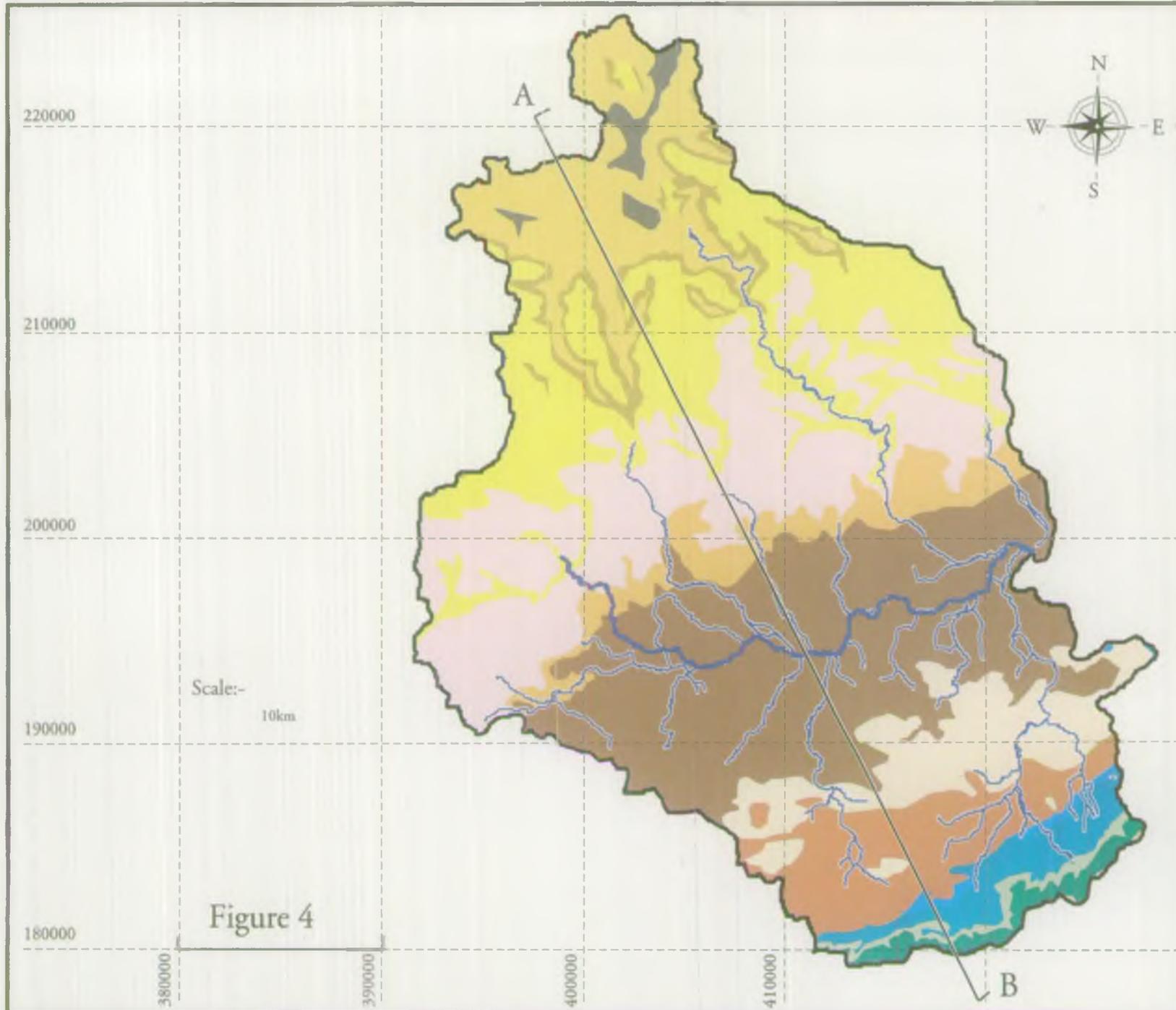
GEOLOGY AND HYDROGEOLOGY

- 2.14 The catchment comprises a series of geological strata of mainly Jurassic age dipping in a south-easterly direction as shown in the cross section (Figure 3) below. To the north west, the Cotswold limestones, the Great and Inferior Oolites outcrop at the surface (see Figure 4) and form the high escarpment of the Cotswold Hills overlooking the Vale of Evesham. South east of Cirencester, these limestones dip underneath the Oxford Clay, then the Corallian strata, the Kimmeridge Clay and finally the Cretaceous clays and Chalk in the extreme south of the area. The clays become progressively thicker to the south east and the oolites more deeply confined. The southern end of the catchment is dominated by the steep chalk escarpment of the northern edge of the Wiltshire Downs overlooking the Vale of the White Horse.
- 2.15 There are two major aquifers (water-bearing rocks) within the catchment: those of the Great and Inferior Oolitic limestones. These limestones are extensively faulted and are highly fissured. They exhibit karstic features such as relatively rapid fissure flow of rainfall percolation and groundwater and rapid changes of groundwater level. As a result, some sections of many of the rivers become dry each year in the summer and autumn (Figure 7).

Figure 3 - Geological Cross section



- 2.16 The ability to transmit groundwater rapidly gives rise to a relatively rapid response to groundwater levels and to river flows, both receding relatively quickly to base levels and flows after just a few weeks of low rainfall. Thus, 'drought' conditions can manifest themselves in a few months with low groundwater levels and river flows in summer and autumn being quite a common natural occurrence. Annual rainfall and percolation data over the last 70 years are portrayed in Figures 5 and 6. The data for the last ten year period is of particular interest as rainfall was generally below average and percolation was the lowest experienced over the last seven decades.
- 2.17 The two oolitic limestone aquifers are separated by the Fullers Earth Clay and thus the two groundwater systems are generally separate on a regional scale. Faulting, however, allows local groundwater exchange between the two aquifers and so the aquifers are in greater groundwater continuity than previously believed.



Upper Thames CMP:

Solid Geology

-  CMP Boundary
-  River Thames
-  Main River
-  Middle Chalk
-  Lower Chalk
-  Upper Greensand
-  Gault
-  Undivided Lwr Greensand
-  Portland Beds
-  Kimmeridge Clay
-  Corallian
-  Oxford Clay
-  Cornbrash
-  Forest Marble
-  Great Oolite
-  Fullers Earth Clay
-  Inferior Oolite
-  Upper Lias

Scale:-
10km

Figure 4



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Figure 5

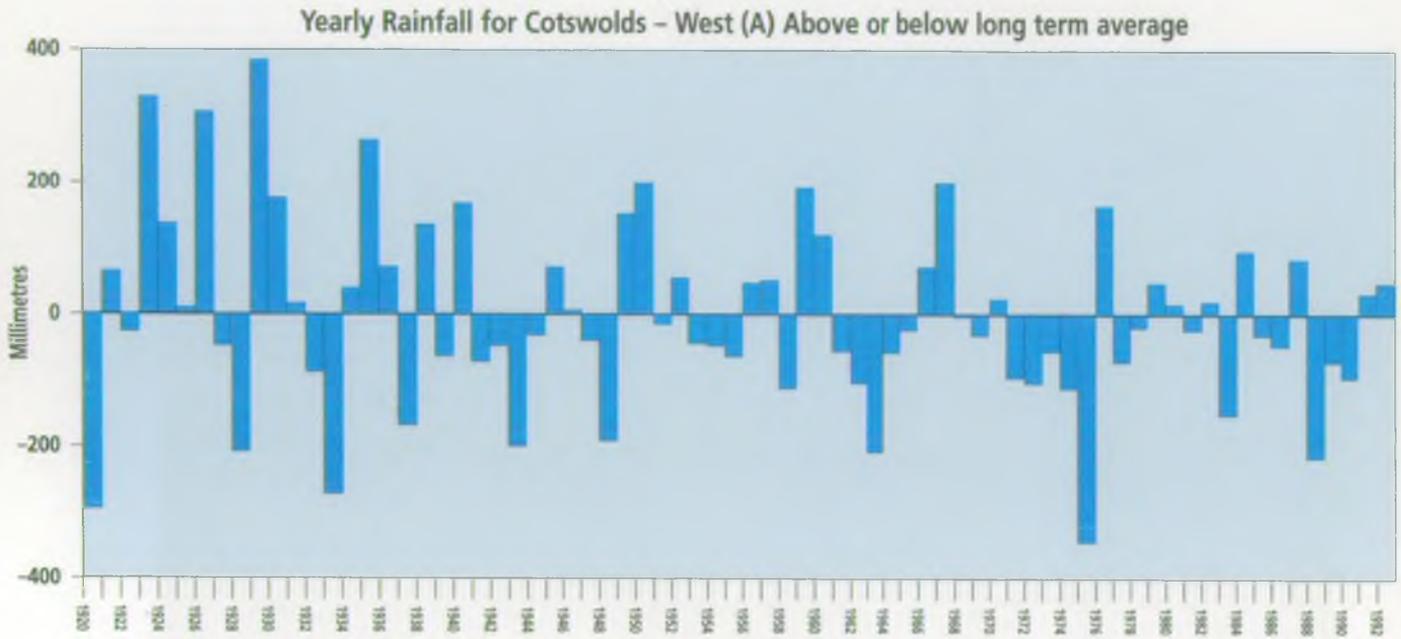
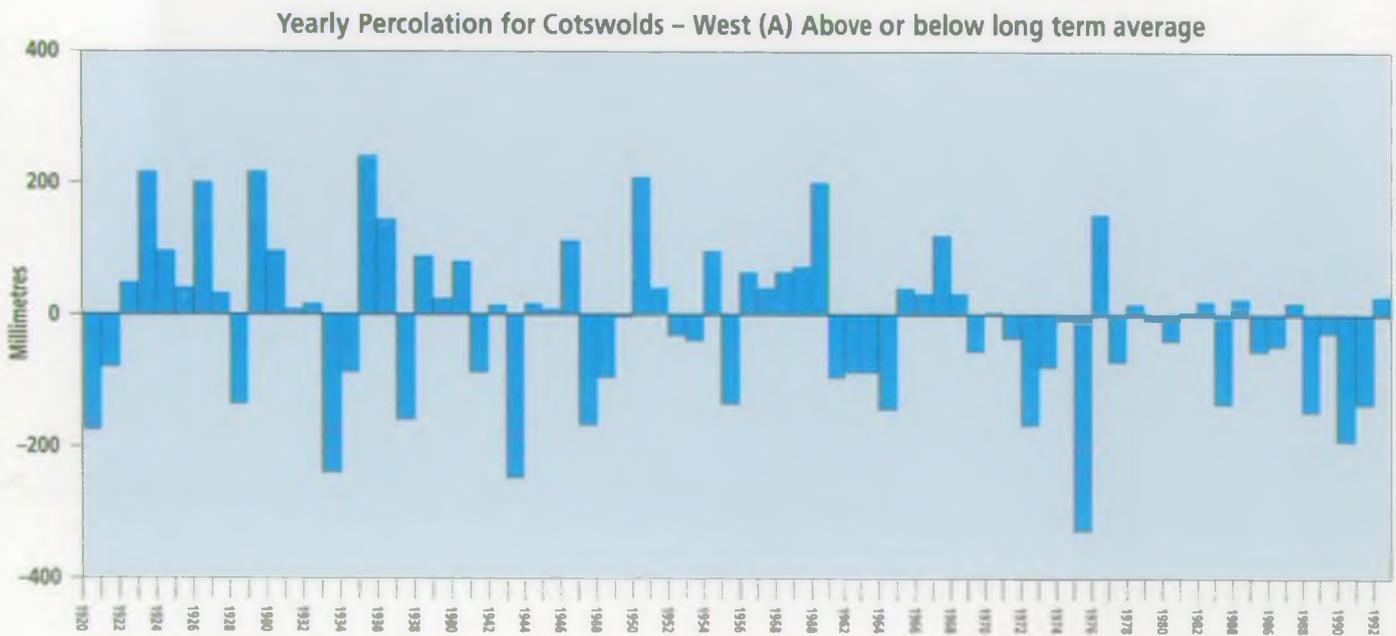


Figure 6



- 2.18 Between the Oxford and Kimmeridge Clays are Corallian strata which are deemed a minor aquifer and important in the Swindon and Shrivenham area.

Soils

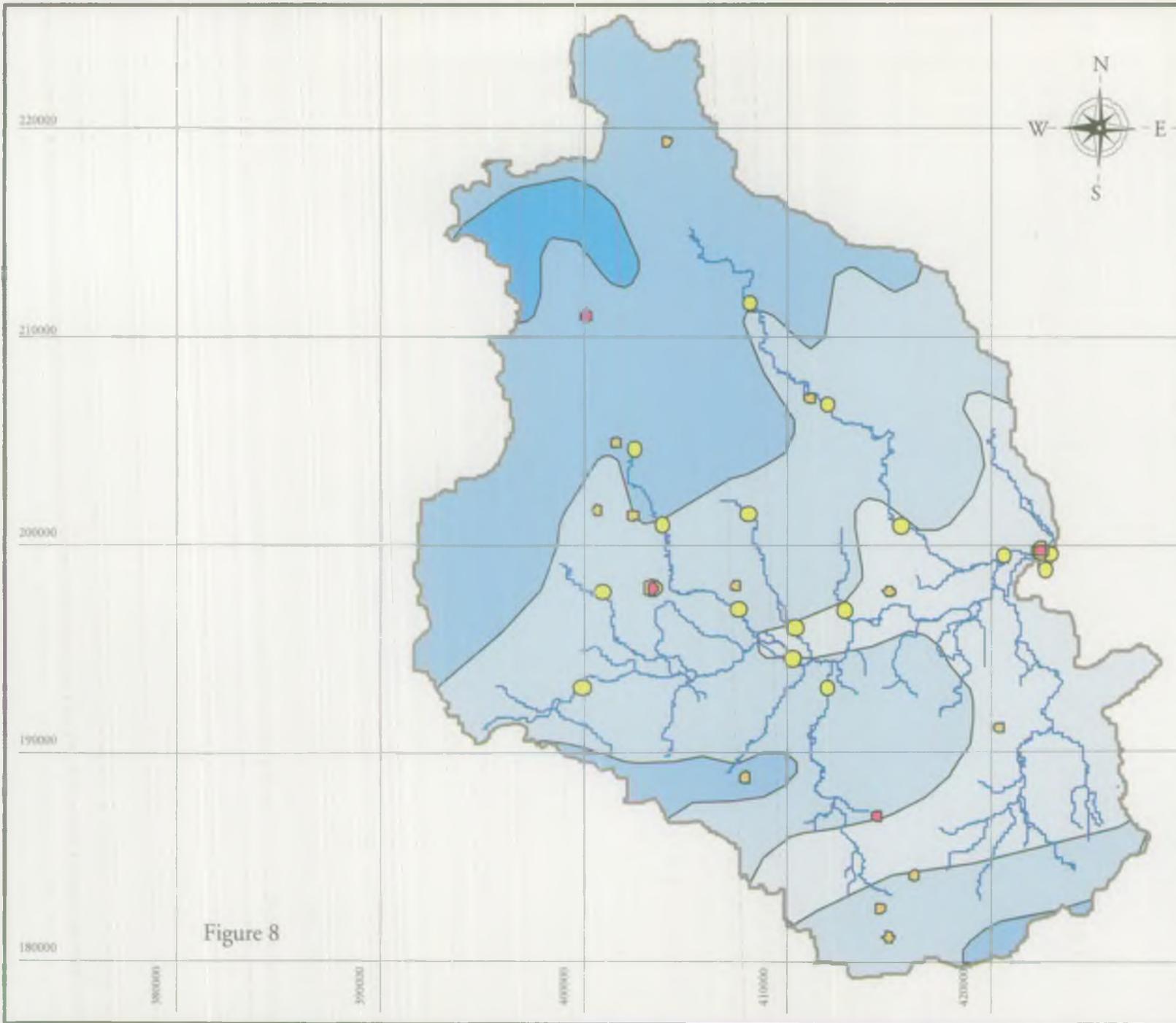
- 2.19 The catchment has a selection of clay-based and chalk soils as the geology suggests eg Pelostagnogly/Stagnogly, Brown Redzinas, Gleyic brown calcareous earths and Grey Redzinas. Soil type is an important control on land use, vegetation cover and in terms of geomorphology, the sediment delivery within the catchment. In areas of the catchment where clay-soils dominate there is felt to be only a small risk of (water) erosion. In fact the clay-vale landscape is described as being the least susceptible to erosion due to low slope gradients and 'cohesive' soil types. However, where chalk soils exist especially on the steeper escarpments the risk is described as 'moderate'. Land use such as intensive arable farming for winter cereals and oil seed rape results in a bare soil surface during the autumn and winter flood season ie potential erosion of topsoil. Where arable fields lie in the floodplain, soil erosion can be locally severe during (overbank) floods.

Geomorphology

- 2.20 Most of the tributaries have a narrow belt of alluvium which consists of relatively stoneless, occasionally calcareous, loamy, silty or clayey material. Calcareous river alluvium is generally restricted to catchments within the Chalk and Jurassic limestone outcrops. An important Pleistocene sequence which occurs within the Upper Thames is the 'Floodplain Terrace' (otherwise known as the Northmoor Terrace). This consists of limestone gravels which reach a maximum of 2-3 m above the alluvium of the modern valley floor. It was probably laid down during the late glacial stage at a time of much higher river discharge. In geomorphological terms, the contemporary rivers, eg, Upper Thames, Churn, Coln, Leach, Ray and Cole may be described as 'inactive' - that is that they have not changed their courses measurably during recorded historical times. However, this is not to say that the courses have not been locally changed by man. Straightening to follow field and farm boundaries may have been common particularly in the upper headwaters. Land use change has inevitably led to an increase of fine sediment, which may serve to obliterate natural gravel riffles and shoals.

RAINFALL AND RIVER FLOW

- 2.21 The average rainfall across the catchment is 770 mm. Rainfall varies depending on topography and meteorological conditions, from 900 mm/year in the Cotswolds to under 600 mm in the lower parts of the catchment (see Figure 8).
- 2.22 The rivers in the northern part of the catchment flow across limestone and are mainly fed by springs. They tend to have higher base flows and respond more slowly to rainfall than clay catchments.
- 2.23 The rivers to the south of the catchment rise on a variety of strata most notably that of Kimmeridge Clay. Some (minor) chalk springs also exist. In clay catchments, summer flows tend to be low and the rivers respond very rapidly to rainfall, ie the rivers on clay are 'flashy'.
- 2.24 Hydrographs for the Rivers Churn, Cole, Coln and Thames (Figure 9 a-d) show the differences between the flow characteristics of the rivers draining the limestone Cotswolds catchments and those draining the southern 'clay' catchments. The River Coln displays the classic characteristics of a groundwater fed stream, with a high base flow, but comparatively low peak flood flows. The Churn shows some of the characteristics of a groundwater fed river, but has a lower baseflow than the Coln. The River Cole is very 'flashy' and the hydrograph is typical of a clay catchment stream.



Upper Thames CMP:

Rainfall & River Flow

-  CMP Boundary
 -  River Thames
 -  Main River
- Rainfall (mm)
-  600 - <700
 -  700 - <800
 -  800 - <900
 -  900 - <1000
-  Flow Gauging Stations
 -  Recording Rain Gauges
 -  Daily Rain Gauges

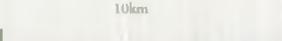
Scale:-
 10km

Figure 8



Figure 9 (a)

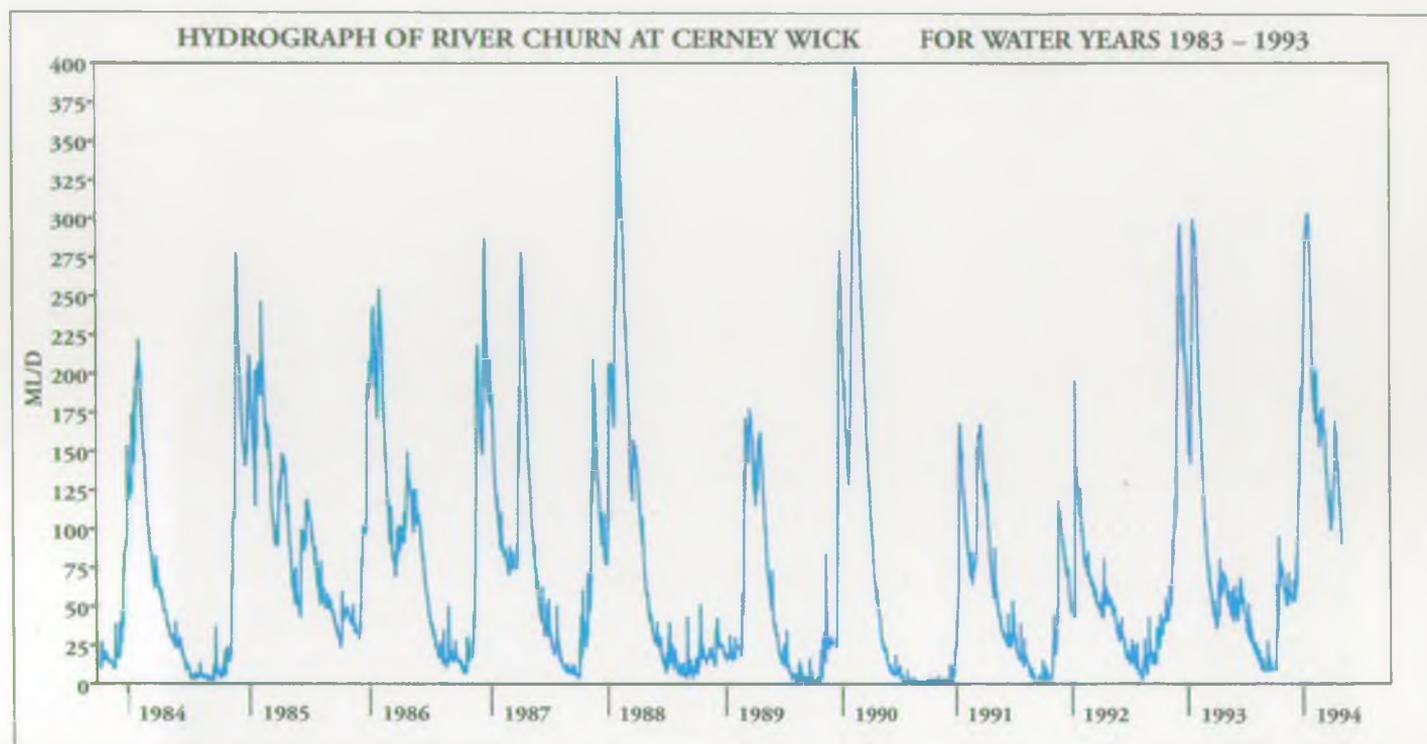


Figure 9 (b)

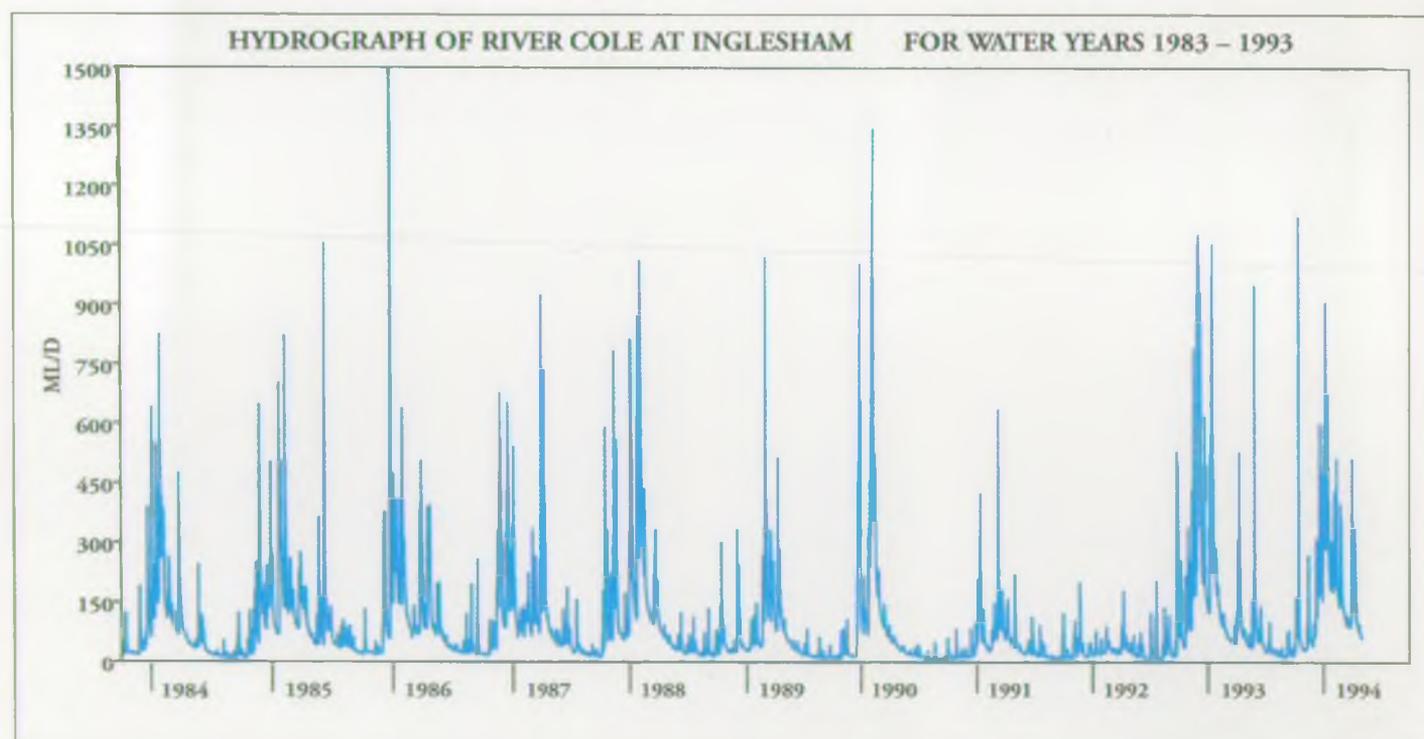


Figure 9 (c)

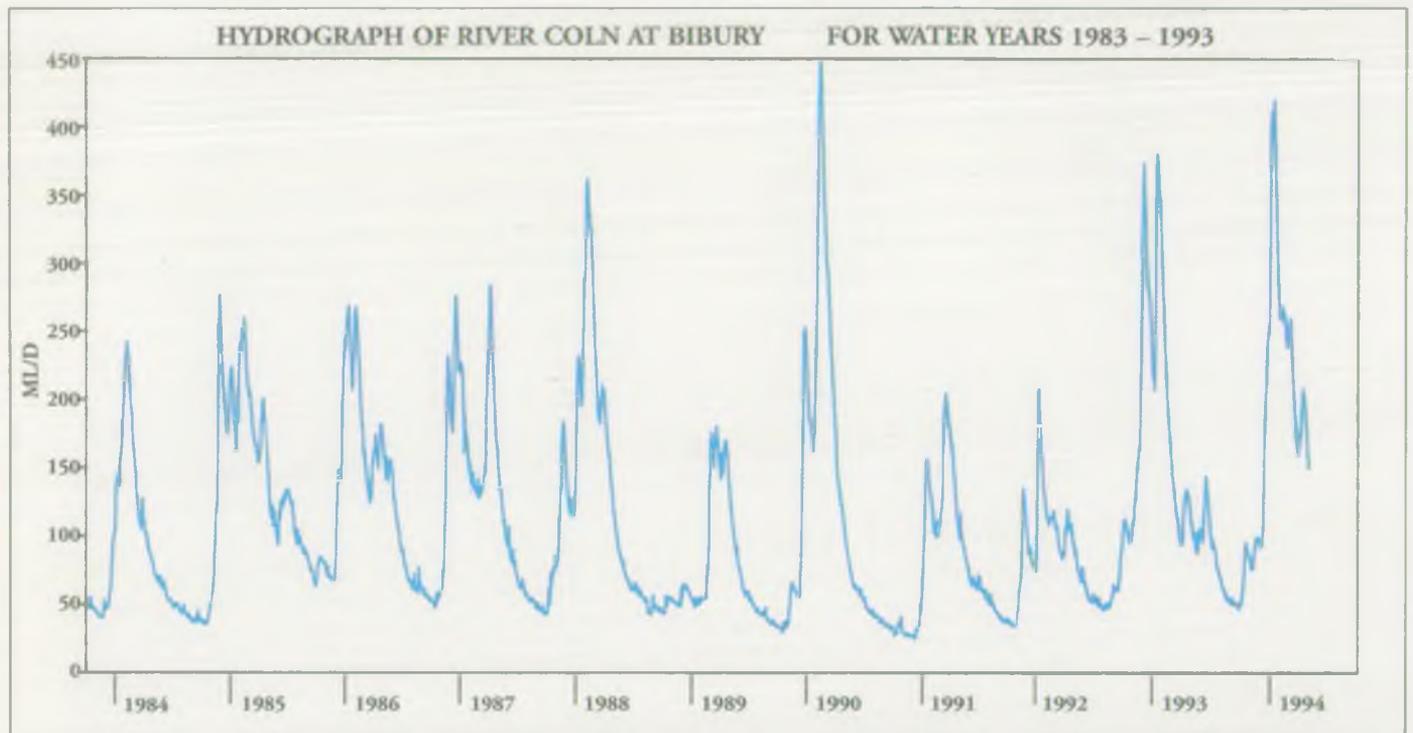
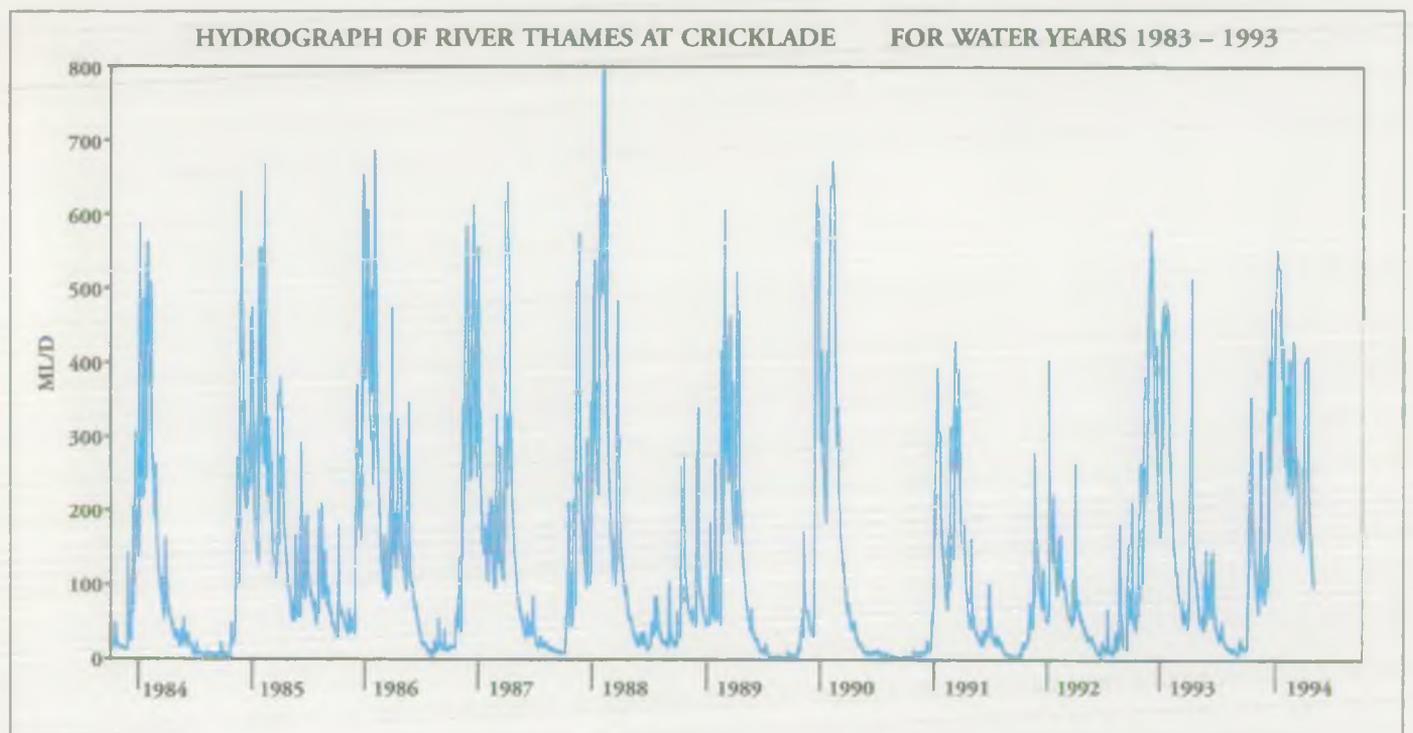


Figure 9 (d)



STRATEGIC AND LOCAL PLANNING

2.25 The table below summarises the areas of the catchment covered by different Local Authorities (see Figure 1).

County Councils	km ²	%	District Councils	km ²	%
Gloucestershire	590	59	Cotswold DC	560	56
Oxfordshire	50	5	Tewkesbury BC	30	3
Wiltshire	354	36	Vale of White Horse DC	50	5
			West Oxfordshire DC	4	<1
			North Wilts DC	160	16
			Thamesdown BC	190	19
TOTAL	994	100%	TOTAL	994	100%

2.26 The population of the catchment area is estimated at 230,000. The main towns and their estimated populations (1991) are given below:

Swindon	150,000
Cirencester	17,600
Highworth	8,000
Wroughton	7,000
Purton	4,000
Cricklade	3,900
South Cerney	3,000
Fairford	3,000
Lechlade	2,500
Shrivenham	2,250
Northleach	1,500
Ashton Keynes	1,400

2.27 Most of the County, District and Borough Councils 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 may have an impact on, or interact with, the water environment.

2.28 More specifically, the government published its Regional Planning for the South West in July 1994. This will guide the development of those parts of the Upper Thames area that lie within Wiltshire and Gloucestershire. The remainder of the catchment is covered by Regional Planning for the South East. The NRA has given due regard to this guidance in preparing this CMP. The particular provisions that may affect this CMP are:

- 3.1/2 all development is to be sustainable and environmental appraisals of all development plans are to be advocated;
- 3.4 degraded areas should be restored and enhanced;
- 3.7 scattered development is discouraged;
- 3.17 Swindon will no longer be expected to grow at previous rates. The 'rural buffer zone' to the north will continue to be protected from inappropriate development;
- 4.27/8 water supply and sewerage issues are to be taken into account in development plans. Water supply sources should be protected and rates of development should not exceed the capacities of existing or planned infrastructure;
- 4.33 development plans should not provide for inappropriate development in areas which are at risk from flooding;
- 7.5 facilities for leisure should be actively encouraged where this is compatible with conservation objectives;
- 7.6 recreation based on rivers and lakes should be consistent with the principles of sustainable development. Plans should set out policies for conservation and development along the routes of national trails;

- 8.6 *minerals planning authorities should recognise that a balance must be struck between the economic and environmental requirements of the community;*
- 8.8 *minerals planning authorities should also ensure that future permissions for mineral extraction should be in accordance with the principles of sustainable development;*
- 9.13 *the improvements to the A417/A419 (Swindon to Gloucester) are important for meeting economic objectives.*

Many of these provisions are likely to form the basis for achieving a sustainable strategy for the Upper Thames area.

2.29 The following development plans apply to the catchment:

Structure Plans

Gloucestershire Structure Plan - 1st Alteration (Approved 1992)
Oxfordshire 2001 Structure Plan - 4th Alteration (Approved 1992)
North East Wiltshire Structure Plan (Approved 1993)

Local Plans

Cotswold District Local Plan (Deposit Draft 1993)
Vale of White Horse Local Plan (Consultation Draft November 1993)
West Oxfordshire Local Plan (Deposit Plan 1993)
North Wiltshire Local Plan (Adopted 1993)
Thamesdown Local Plan (Deposit Draft 1994)
Tewkesbury District Local Plan (Consultation Draft due September 1994)

Minerals and Waste Local Plans

Oxfordshire Minerals and Waste Local Plan (Deposit 1993)
Wiltshire Minerals Local Plan (Public Consultation Draft September 1994)
Upper Thames Policy Review 1993 - Gloucestershire CC (non-statutory plan, currently updating Minerals Plan)

- 2.30 In general the NRA's representations on development plans have concentrated on the preservation and enhancement of the water environment. It is hoped that these representations would help to cement CMPs into the development planning process.
- 2.31 In particular, the NRA considers that the Upper Thames Valley constitutes a natural resource of great environmental, cultural, and historic value. Any development proposals should therefore be controlled to ensure they are environmentally sustainable. In particular the exploitation of aggregates should not exceed the environmental capacity of the Cotswold Water Park Area.
- 2.32 Since the United Nations Earth Summit in June 1992, local authorities have been considering their response to Agenda 21 which encourages wider access to environmental information, greater community participation in decision making, and the adoption of sustainable development principles. A number of environmental audits and strategies have now been produced by relevant councils and the NRA will continue to assist authorities in this area.

- 2.33 Consistent with the aims of sustainable development, the NRA has asked (for example Gloucestershire CC) that plan policies should aim to achieve the following objectives:
- (i) meet the basic needs of all the inhabitants;
 - (ii) secure and stimulate economic prosperity in all parts of the county;
 - (iii) conserve and enhance the environment;
 - (iv) maintain a high quality of life.
- 2.34 The details of further developments planned in the catchment are given in Rural Land Use (3.85) and Urban Land Use (3.100). Generally the area is deemed to be one of development restraint with its extensive areas of AONB and other landscape designations. The only real growth area is Swindon with other pressure points being the Cotswold Water Park and the M4 corridor.

SECTION 3

CATCHMENT USES

3. CATCHMENT USES, RESOURCES AND ACTIVITIES

INTRODUCTION

- 3.1 This section describes current and future uses of the water environment within the catchment and what we feel are its key resources and activities undertaken. Current uses include activities planned to be completed in the short-term whilst future uses include potential activities. For each of the catchment uses, the following information is provided:

Catchment Perspective - this describes how the use manifests itself within the catchment.

Environmental Objectives - this suggests broad-based environmental objectives for the conservation and enhancement of the use and/or the water environment. These are proposed objectives for the NRA and others to follow as they continue their work. Although they are in sympathy with published NRA aims and strategies, these objectives are not statements of NRA 'policies'.

- 3.2 In most cases, the description of the use is a summary of detailed reviews, investigations or studies produced by the NRA and/or other organisations.

NATURE CONSERVATION AND LANDSCAPE

- 3.3 The term 'river landscape' describes the entire river corridor and incorporates all the physical and ecological resources in the corridor. The limits of a river corridor are arbitrarily defined but can include the area viewed from the river or a river valley and in some instances the entire floodplain.
- 3.4 The landscape reflects the complex interplay between the natural environment and man's activities. Geomorphology, topography and drainage provide the basic elements of the landscape and, together with associated vegetation and settlement patterns, determine the essential landscape character of different areas.
- 3.5 A key element of a river landscape is the natural environment. Thus, nature conservation is a central feature in the river landscape.
- 3.6 The NRA seeks to maintain and enhance the quality of the river landscape as part of its statutory functions. In most instances, the Authority does not have direct control over the development of the river corridors and must rely on influencing the planning process and the use of advocacy techniques to influence development.
- 3.7 The NRA wish for local authorities to review the extent of their non-statutory landscape designations and has made representations for the Upper Thames Valley to be protected by such a designation. To this end the NRA has carried out strategic landscape assessments within the CMP area.

Catchment Perspective

- 3.8 The Cotswold Hills are considered a high quality landscape which is characterised by open wolds, dry stone walls, ancient woodlands and shelter belts, deep river valleys with meandering streams and historic towns and villages. The Oolitic limestone of the Cotswolds supports unimproved grasslands and woodlands of a high nature conservation value.

- 3.9 The River Churn valley to the north of Cirencester is an attractive, open, flat, valley with water meadows. The Coln and Leach occupy narrow, deep, valleys which break up the smooth, undulating, expanse of the Cotswold dip slope.
- 3.10 The very high quality and variety of the Cotswold landscape has been recognised through its designation as an AONB by the Countryside Commission. The northern section of the catchment area between Cirencester and Brockhampton lies entirely within the Cotswold AONB. A management strategy for the AONB is being prepared by the Cotswold AONB Officer on behalf of the Joint Advisory Committee. An Issues Report was published in April 1994 and the draft management strategy is due by mid-1995.
- 3.11 Part of the Cotswold Hills have been designated an Environmentally Sensitive Area (ESA) by MAFF and there are in addition a number of countryside stewardship schemes in operation in the area. Both schemes offer management agreements to farmers and land managers to enhance and conserve landscapes and habitats. The Upper Thames ESA also exists but none of its catchments fall within this CMP area.
- 3.12 The Cotswold Water Park is the largest concentration of open water in southern Britain. The calcareous nature of the water makes natural vegetation and invertebrate colonisation extremely rich and varied. There are 26 SSSIs within the entire catchment area (see Table 3.1), including the Cotswold Water Park SSSI (encompassing eleven of the lakes) which has been recently designated by English Nature (see Figure 10). This designation is based upon the plant communities present. In addition to the SSSIs many other sites of notable conservation value have been identified and form an important part of the ecological resource of the catchment area.
- 3.13 The Cotswold Water Park is of national importance for wildfowl and may qualify for SPA and RAMSAR status, although its eligibility for such status has recently been questioned. The site is however nationally significant for the wintering populations of seven bird species and breeding populations of two bird species.
- 3.14 There are extensive areas of ancient woodland to the north and west of Cirencester particularly along the valleys of the Rivers Churn and Coln.
- 3.15 Land use in the southern half of the catchment area is dominated by Swindon, by transport corridors and by other infrastructure uses such as the airfields at Fairford, South Cerney and Kemble.
- 3.16 The southern part of the catchment area to the south east of Swindon lies within the North Wessex Downs AONB. Other countryside areas to the north of Wroughton and Wanborough, south and east of Highworth, and south west of Cirencester, are designated by the respective local authorities as either Important Local Landscapes, Special Landscape Areas or Areas of High Landscape Value, rural buffer zones or important areas of open land.
- 3.17 The Upper Thames Otter Habitat project was initiated by the 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 project, 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.

- 3.18 River corridor surveys have been carried out within the last two years on the rivers Cole, Ray, Churn and Ampney Brook and will be undertaken on the rivers Coln and Leach in 1994/95. The corridor surveys on the Cole and Ray were commissioned to provide information which could be incorporated into the development plans for the creation of a community forest in the Swindon area. Their general conclusion confirmed that the rivers in the northern part of the catchment have a higher ecological value than those in the south. The lower values in the south were attributed to intensive agriculture, urban development and past river improvement schemes. Also, the River Thames from source to Buscot has been river corridor surveyed this year.
- 3.19 The NRA has undertaken a strategic landscape assessment of the Coln and Leach catchments. The assessment concluded that much of the river corridor in these catchments is of high value and demanding conservation measures whilst certain reaches have been degraded and warrant restoration. The findings of the assessment are discussed in Section 4.

Table 3.1 - Upper Thames - Sites of Special Scientific Interest

Name	Grid Ref.	Nearest watercourse	Type
Barnsley Warren	SP 055064	Ampney Brook	BotG
Elmlea Meadows	SU 079948	Thames	BotG
Foss Cross Quarry	SP 056092	Ampney Brook-remote	GeoL
Hampden Railway Cutting	SP 062205	Remote	GeoJ
Hornsleasow Roughs	SP 117323	Remote	BotG
Puckham	SP 010224	Trib of Coln-remote	Bot3
Whelford Meadow	SP 168000	Coln	BotG
Winson Meadows	SP 0903081	Coln	BotG
Wicklesham & Coxwell Pits	SU 28559425		
	SU 28959415		
	SU 29209420	Cole-remote	GeoG
Tuckmill Meadows	SU 240900	Tuckmill Brook	BotG
Burderop	SU 165810	Ray	BotW
Clattinger Farm	SU 012933	Thames/Swill Bk	BotG
Clouts Wood	SU 137796	Ray	BotW
Coate Water	SU 188820	Dorcan Brook(Cole)	FauB
Emmet Hill Meadow	SU 009901	Thames/Swill Bk	BotG
North Meadow	SU 098944	Thames	BotG
Okus Quarry	SU 147836	Ray	GeoP
Restrop Farm & Brockhurst Wood	SU 073866	Thames/Key	Bot2
The Coombes	SU 228826	Trib of Cole	BotG
Old Town Railway Cutting	SU 153832	Ray	GeoJ
Upper Waterhay Meadow	SU 069837	Thames	BotG
Pike Corner	SU 036934	Thames/Swill Bk	BotG
Stony Furlong Railway Cutting	SP 063106	Trib of Coln	GeoL
Distillery Farm Meadow	SU 027892	Thames/Swill Bk	BotG
Wildmoorway Meadows	SU 066973	Churn	BotG

Key to types:

BotG	-Botanic/grassland	GeoL	-Geological/Limestone
BotW	-Botanic/woodland	GeoG	-Geological/gravel
Bot2	-Botanic/grassland woodland	GeoP	-Geological/Portland Succession
Bot3	-Botanic/grassland woodland marshland	GeoJ FauB	-Geological/Jurassic -Fauna/bird population

Note: Does not include Cotswold Water Park details

3.20 MAFF have produced (jointly with the Association of drainage authorities, the NRA, English Nature and RSPB) a guide 'Water Level Management Plans - A Procedural Guide for Operating Authorities' (1994) to assist operating authorities, eg NRA, 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-dependent SSSIs) can be balanced and integrated. Part of this guide stresses the importance of water levels to agriculture and soil structure. As they are drafted, these plans will form an essential input to CMPs. English Nature are currently programming key sites for management planning. The NRA will be producing interim water level management plans for water-dependent SSSIs in Thames Region by the end of 1995. The Upper Thames catchment contains two; North Meadow (near Cricklade) and Pike Corner both in Wiltshire. The Upper Thames contains a number of herb-rich meadows to be found along side rivers ie within the floodplain. Of these, North Meadow is outstanding in a national context; it boasts an extremely rich and diverse flora including Snakeshead Fritillary due to traditional hay meadow management over several hundred years. The NRA will seek to conserve these ecological resources.

Environmental Objectives

- 3.21 To protect and conserve highly valued river landscapes and habitats and enhance degraded river landscapes and habitats.
- 3.22 To safeguard and enhance the special ecological interest for which sites have been designated (eg SSSI).
- 3.23 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.
- 3.24 To carry out channel and riparian enhancement schemes on currently degraded rivers and river corridors.

FISHERIES

3.25 This use and resource relates specifically to the maintenance of breeding populations of salmonid (ie game) and cyprinid (ie coarse) fish. European Commission (EC) Freshwater Fisheries Directive (78/659/EEC) 'on the quality of waters needing protection or improvement in order to support fish life' provides a statutory basis for the protection of water quality in certain rivers. Fish populations provide useful information on the general health of the aquatic ecosystem because they are biological indicators of changes in river flow, habitat and quality and are near to the top of the food chain in river systems. Fish populations are also exploited by commercial and recreational fisheries and contribute to the diversity of the water environment.

Catchment Perspective

- 3.26 The catchment provides high quality game and coarse fishing. The limestone streams to the north of the catchment, including the Leach, Coln and Churn, contain good populations of brown trout whilst the streams to the south tend to support coarse fisheries. The condition of the fisheries in each of the main rivers, based on the most recent surveys, are described below.
- 3.27 The River Thames supports a coarse fishery. When last surveyed in 1987, poor water quality, probably attributable to effluent from the Swindon Sewage Treatment Works (STW), was having a noticeable

3.27 (continued)

impact on the fishery. With recently improved effluent quality from the works, the fishery should improve. Poor physical habitat also affects the fishery in this area. This reach is now being resurveyed. With the improved technology now available, results should now accurately reflect the fisheries status of the river.

- 3.28 The River Leach supports a thriving brown trout population. In the downstream reaches, rainbow trout are present as a consequence of escapes from fish farms. Coarse fish from the River Thames are also found in the lower reaches. This river was last surveyed in 1993.
- 3.29 The Coln below Bibury is managed as a recreational trout fishery. The river is regularly stocked with brown and rainbow (takeable size) trout throughout its length. Trout are also present in some of the upper reaches. In general, the Coln fishery is good. However, the recruitment of young fish is poor, possibly as a consequence of low flow conditions and the siltation of spawning gravels. The river was last surveyed in 1990.
- 3.30 The fishery in the Ampney Brook is poor, mainly as a consequence of very low flows. In 1989, 90 and 91 (as a consequence of severe drought) the Brook dried up completely and the only fish now present have migrated from the Thames.
- 3.31 Upstream of the Cotswold Water Park, the River Churn is an important recreational brown trout fishery. The river is regularly stocked. Downstream of the Water Park, coarse fish tend to dominate as a consequence of a change in habitat and migration from the River Thames. The brown trout fishery in the upper reaches does not perform as well as expected probably as a result of low flows and associated poor habitat, which combine to reduce recruitment to the population. This was last surveyed during 1989.
- 3.32 The River Ray immediately below Swindon STW supports a large biomass of coarse fish, possibly utilising the effluent as a food resource. However, from approximately 0.5 km downstream of the works to the Thames confluence, the fish population is very poor. This is probably a consequence of poor habitat and water quality ie dissolved oxygen. Upstream of Swindon STW the fishery is not viable as a consequence of naturally insufficient flows.
- 3.33 The River Cole contains a coarse fishery. This fishery does not perform as well as might be expected. A combination of urban and industrial sources in the Swindon area have led to pollution incidents and poor quality run-off which are a likely cause for the poor performance. In addition, past unsympathetic drainage works have affected the in-stream habitat detrimentally. This was last surveyed in 1992.
- 3.34 The Cotswold Water Park provides a mixture of high quality game and coarse fisheries.
- 3.35 The Water Park and many of the rivers are stocked regularly by the NRA and angling clubs. Stocking is carried out for a variety of reasons, including the replacement of stock caught by anglers, establishment of fisheries in the newly flooded gravel extraction pits and re-establishment of the fishery following a pollution incident.
- 3.36 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 collect general information on a range of factors, including flows and the impacts of pollution incidents.
- 3.37 Improvements to the fishery habitat in the River Ray are being considered by the NRA and a substantial

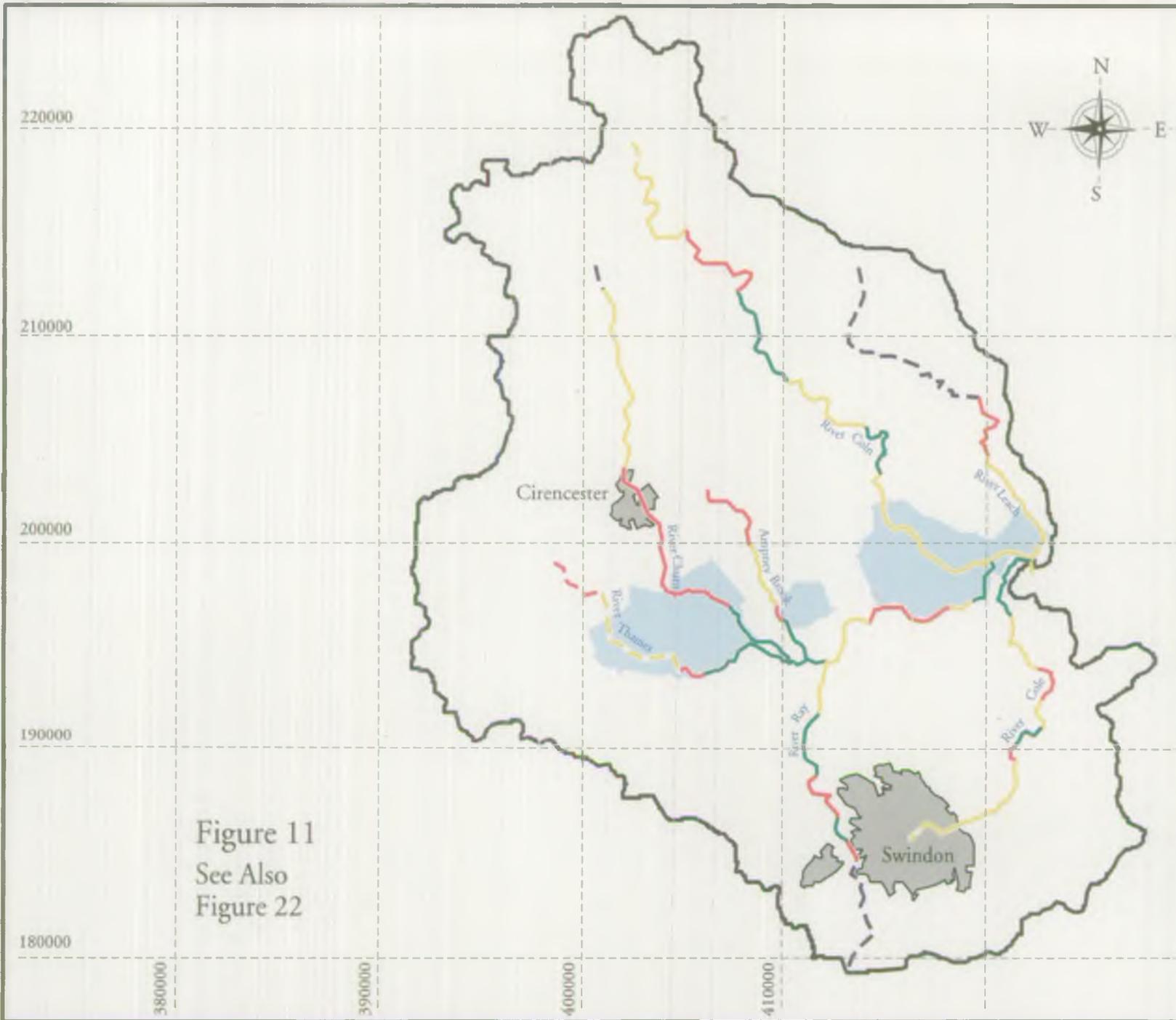


Figure 11
See Also
Figure 22

Upper Thames CMP:

Fisheries

-  CMP Boundary
 -  Urban Area
- Biomass of Major Fish Species >10cm in Length**
-  $< 10\text{g/m}^2$ (Poor Quality)
 -  (Non EC)
 -  $10 - 20\text{g/m}^2$ (Moderate Quality)
 -  (Non EC)
 -  $> 20\text{g/m}^2$ (Good Quality)
-  Non EC Designated Watercourses
 -  Stillwater Fisheries (127) Including Game Fisheries.
- Scale:-




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3.37 (continued)

habitat improvement scheme is planned for a section of the River Cole at Coleshill. This scheme is part of an EU LIFE fund supported demonstration project on river restoration - one of two sites chosen in the UK. The aim of this project is to illustrate the integrated approach to comprehensive restoration on environmentally degraded rivers. The project will be run by Rivers Restoration Project Ltd and partially funded by the NRA (approximately £70K over 3 years for NRA-TR alone). Works will include re-profiling of the channel to include pool/riffle sequences, restoration of river bank and corridor habitats, restoration of river meadow whilst maintaining flood protection standards and improving access to the site. The project may require a degree of pre- and post-project monitoring of factors such as detail geomorphological assessment, water quality including sediment monitoring, hydrology, ecology and public perception.

3.38 In both the Ray and the Cole the improvements in habitat are required as a consequence of unsympathetic drainage and channel maintenance activities in the past. Habitat enhancement is also taking place on the River Leach at Fyfield. The significant habitat enhancements that have taken place recently include:

- (i) enhancements to river bed substrate and old ponds on the River Leach at Fyfield;
- (ii) major channel enhancement work and river narrowing on the River Coln at Coln St. Aldwyn;
- (iii) shelf creation and gravel bed remediation on the River Cole at Sevenhampton;
- (iv) construction of two trout spawning weirs on the River Coln;
- (v) enhancements of spawning gravels using jet washing and rotovating on the rivers Coln and Leach; and,
- (vi) provision of brown trout incubation boxes on the River Leach.

Environmental Objectives

3.39 To establish diverse and sustainable fish populations within the catchment.

3.40 To identify and address physical, chemical and biological factors preventing the achievement of the above.

3.41 With the co-operation of riparian owners and angling interests, increase the recruitment of both brown trout and coarse fish, by the physical manipulation of the habitat.

HERITAGE

3.42 Heritage deals with features of archaeological significance, areas which have been designated as conservation areas because of their urban form, and sites which are of heritage value because of their historic or archaeological importance. Many of these sites have a strong relationship with the landscape.

Catchment Perspective

3.43 The counties of Wiltshire, Oxfordshire and Gloucestershire contain a wealth of archaeological features which vary from isolated visible remains such as earthworks, to broad tracts of countryside where the range of features creates an archaeological landscape. Important features within the catchment area include barrow groups, ancient trackways and Roman roads, Iron Age hill forts and the archaeological features of the North Wessex Downs and the Upper Thames Valley.

- 3.44 Although much of the area is famous for its ancient landscape it also has many features representing later periods including Saxon and medieval settlements and their field systems, and post-medieval features such as water meadows. In terms of industrial heritage there are a number of important features such as the Thames & Severn, and Wilts & Berks Canals. There are a large number of ancient monuments in the catchment area with particular concentrations in Cirencester and Cricklade.
- 3.45 The catchment area also has a large number of conservation areas, buildings of historical or architectural interest, large country houses and many parks and gardens of special historic interest as listed by English Heritage.

Environmental Objectives

- 3.46 To safeguard the special archaeological and heritage interest for which sites have been designated (eg conservation areas).
- 3.47 To conserve areas of archaeological and heritage value.

AMENITY AND RECREATION

- 3.48 Activities such as walking, bird watching, angling, boating, sailing, rowing, canoeing, cruising and picnicking bring people into close proximity with the water. The principal concerns are the general aesthetic acceptability of water features, access to and along watercourses and the provision of appropriate facilities. The key physical resources in the catchment include the rivers themselves, and the Cotswold Water Park, an area containing over 120 man-made lakes.

Catchment Perspective

- 3.49 The River Thames Recreation Strategy, currently in its consultation stage, is a project co-funded by the Sports Council in conjunction with the NRA. The main aim of producing this strategy for the River Thames and its banks is to optimise its recreational potential whilst conserving the nature conservation, landscape and heritage value. The Thames Recreation Strategy will also form an important part of the catchment management planning process, providing guidelines for the management of the River Thames as a recreational resource.
- 3.50 The catchment area is of value for both informal countryside recreation and leisure, and organised sports activities. There is an extensive network of rights of way including a number of long distance paths such as the Thames Path, the Ridgeway and the d'Arcy Dalton Way (see Figure 12).
- 3.51 The key recreational resources are the River Thames and the Cotswold Water Park. Both are used for a range of recreational activities, including cruising, canoeing, angling, walking and boating. At the Liden Lagoon, a flood storage lagoon situated on the Liden Brook to the south of Swindon owned by the NRA, recreational activities are restricted to angling and walking. Most of the major rivers are used for some form of recreation, mostly angling.
- 3.52 The Thames Path was designated by the Secretary of State for the Environment in September 1989. It is being jointly promoted by the Countryside Commission and the NRA and the declared intention is to establish a walkway for over 200 miles from the Thames Barrier at Greenwich to the source of the River Thames near Kemble, Gloucestershire. In the Upper Thames, the Thames Path will increase awareness of this remote area and encourage an increase of visitors especially to its official source, known as Thames Head.

- 3.53 The Cotswold Water Park is an important recreational resource. Thirty-four lakes accounting for about half the total water area of the park are used for some form of water-based recreation including water skiing, dinghy sailing, jet skiing, windsurfing, game and coarse angling. A few areas have been developed as Country Parks (Keynes and Neigh Bridge) or for public access and picnicking. Public footpaths and bridleways have also been improved and developed. Several lakes remain unrestored and there is further potential for recreational activities. Recently, cases of dermatitis were reported from persons in contact with the water at Keynes Country Park. The NRA was called in to identify the offending organism and signs were erected warning the public about this problem.
- 3.54 Within the Water Park area, 11 of the lakes are designated as SSSIs but some 64 are of ornithological importance. It is therefore essential that the requirements and pressures of recreation are balanced with the significant conservation interest of the area.
- 3.55 A number of tourism-related developments have taken place in the western section of the Water Park, including the Watermark holiday homes development, Cotswold Hoburne caravan park and Gloucestershire CC South Cerney Water Sports Centre. Permission has also been given for two golf courses and a hotel at Fairford and South Cerney, and there are proposals for an international rowing and canoeing course at Cleveland Lakes.
- 3.56 Angling is an important recreational use of much of the catchment including the Cotswold Water Park. There are in excess of 25 angling clubs in the catchment and this large number is indicative of the high level of fishing interest.
- 3.57 Canoeing is also an important recreational use. Currently canoeists use reaches of the Rivers Thames, Ray, Churn and Coln.

Environmental Objectives

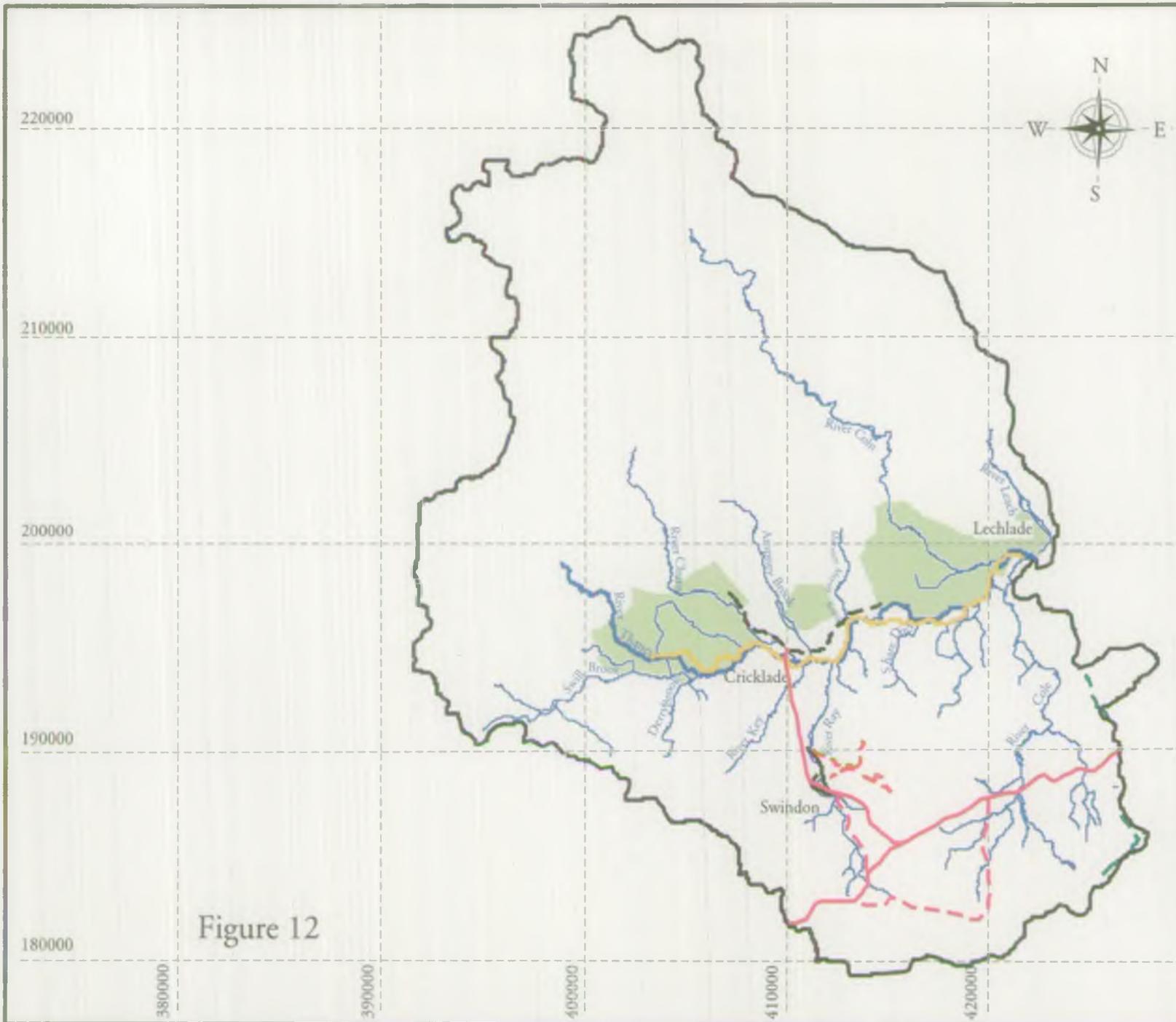
- 3.58 To protect and promote all appropriate water-related recreational uses, including the provision of sufficient access as required for recreational purposes.
- 3.59 To ensure that the above is balanced with safeguarding the riverine environment, nature conservation and landscape value of the Upper Thames.

NAVIGATION

- 3.60 This use relates to those waterways for which there is a statutory right of passage for boat traffic. The amenity and recreation, fisheries and landscape and heritage elements of navigation are considered in other use category descriptions.

Catchment Perspective

- 3.61 Within the plan area, the Thames is a public navigation between St. Johns Lock and Town Bridge, Cricklade (19.2 km/12 miles). Above that, the river is private and the right to navigate must be negotiated with the riparian landowner (see Figure 13).

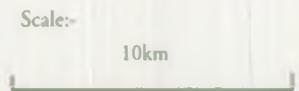


Upper Thames CMP:

Amenity & Recreation

-  CMP Boundary
-  Cotswold Water Park Boundary
-  River Thames
-  Main River
-  Line of Wilts & Berks Canal
-  Wilts & Berks Canal (Restoration)
-  Proposed Restoration of Thames-Severn Canal
-  Proposed Cycleways
-  d'Arcy Dalton Way
-  Ridgeway
-  Swindon & Cricklade Railway
-  Thames Path

Note:
Official slipways/landing points exist at Cricklade and Lechlade



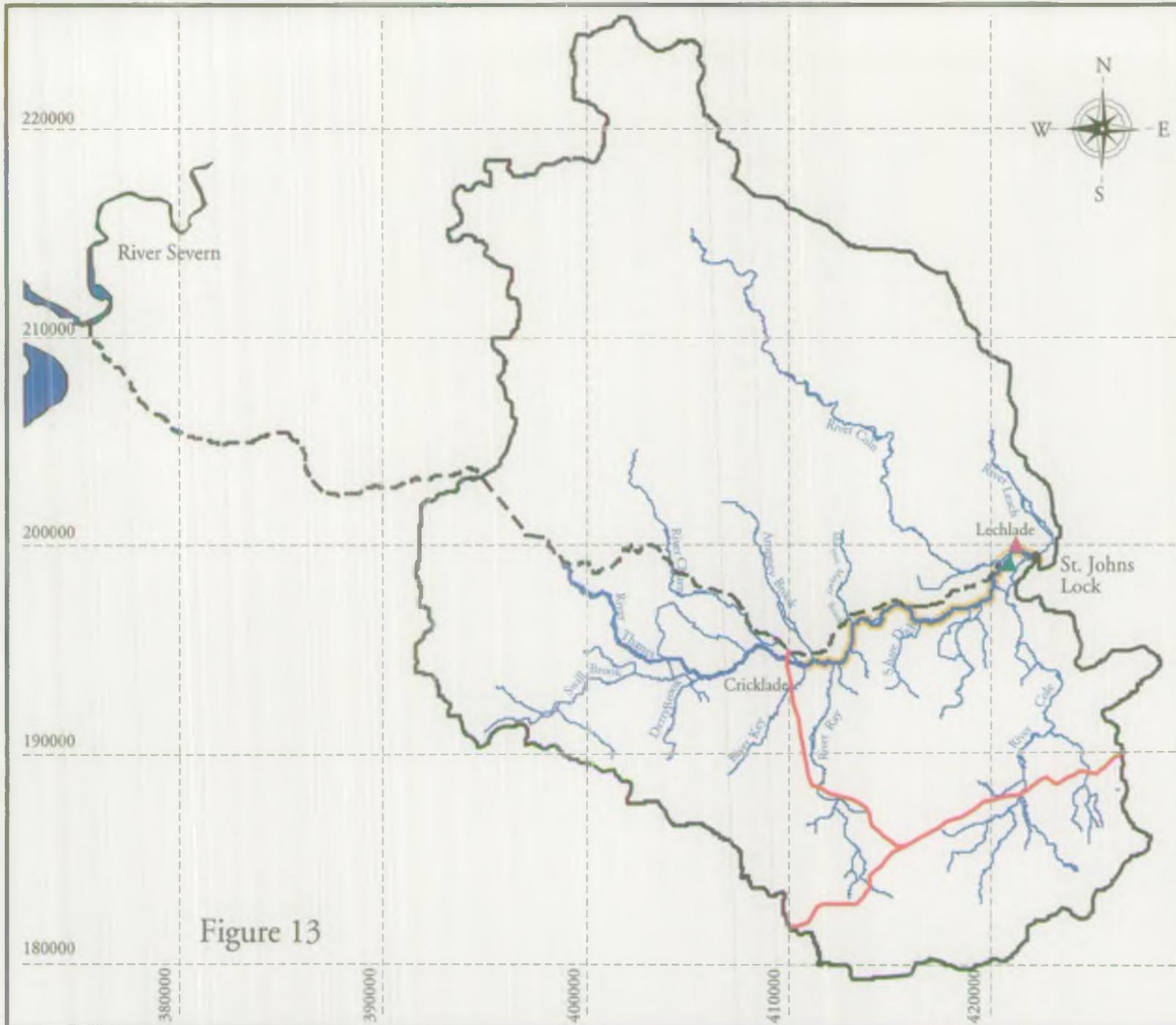
NRA
National Rivers Authority
Thames Region

Figure 12

- 3.62 Above the Round House at Inglesham (at the site of the derelict lock to the Thames & Severn Canal), the river begins to narrow and is unsuitable for larger craft. Shallows at Hannington Bridge restrict all but the smaller craft and some portaging may be needed. In the summer, an increase in aquatic plant growth add some further difficulty to passage. Engineering works to increase the navigability of this stretch to Cricklade have been reviewed in the past. A decision was taken by NRA and the local authorities not to change the important natural habitat of the river in this area. It is, however, still a public navigation for all craft able to cruise to Cricklade.
- 3.63 NRA staff control the tow path and navigation on the Thames in this catchment. They are also responsible for maintaining water level between +3' and -5' of standard Head Water by the use of weirs.
- 3.64 The only lock within the area is St. Johns Lock at Lechlade. Its facilities for boaters includes a sanitary station. It is here that the statue of Old Father Thames rests. This statue originally marked the site of Thames Head near Kemble in Gloucestershire but was moved to its present location in 1974. The average number of lockages for the 1991-93 period was 4124 (6269 craft). The vast majority of these were 'launches' - vessels with an engine.
- 3.65 The limited moorings in this area are fully utilised. About 50 moorings exist; those at the Roundhouse, the Trout, Lechlade and Inglesham, are all privately owned, those at St. Johns Lock are NRA owned. Approximately another 120 off-river moorings exist at the recently expanded Riverside Marina, Lechlade. As part of the planning permission conditions for the latter, the NRA now control a 24 hour (free) mooring site on the frontage of the Riverside Inn itself.
- 3.66 There are plans to re-open the Thames & Severn and Wilts & Berks canals. Whilst these canals will undoubtedly provide a valuable recreation resource, their reopening raises a number of multifunctional issues including water supply, water quality management and conflict with other uses. Probably of most immediate concern is the issue of water resources as a consequence of the limited potential for water resource development in the catchment.
- 3.67 Section 79 of the Thames Conservancy Act 1932 allows the public the right of navigation on the Thames. There is no such public right of navigation on the tributaries. The 'Thames Navigation and General Byelaws 1957', rules established to govern activity on the navigation, have been updated and a new set of guidelines were in force from the 1 November 1994. The byelaws will include a number of changes such as enforcement of a speed limit and the 'definition' of bridge jumping as an offence.

Environmental Objective

- 3.68 To maintain or improve water resources and physical characteristics in the catchment to sustain the Thames navigation.



Upper Thames CMP:

Navigation

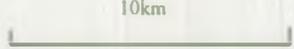
-  CMP Boundary
 -  River Thames
 -  Main River
 -  Rights of Navigation
 -  Line of Wilts & Berks Canal
 -  Thames-Severn Canal Route
 -  Lock
 -  Moorings (4)
 -  Marina
- Scale:-
 10km

Figure 13

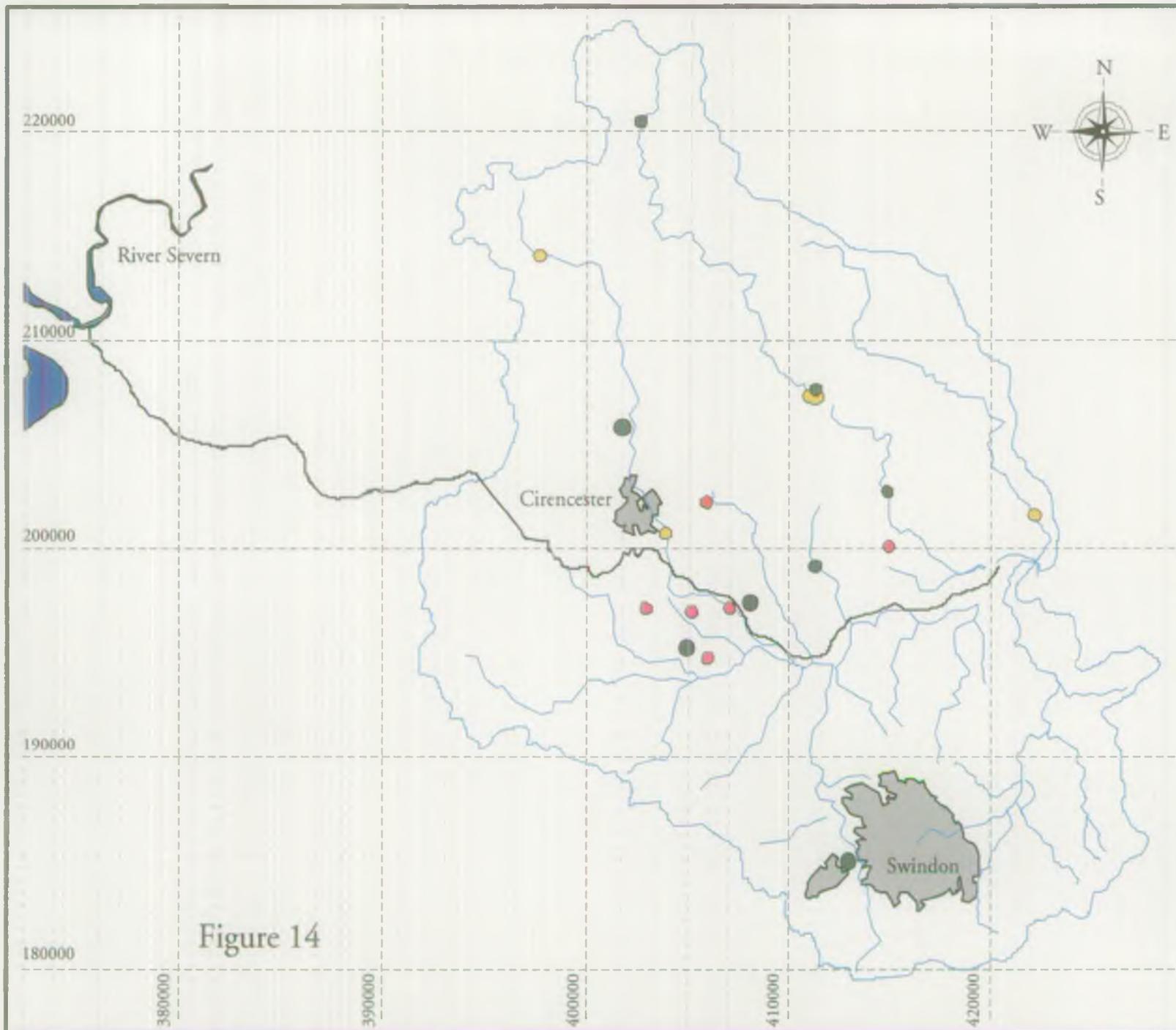


WATER ABSTRACTION

3.69 This use deals with the abstraction of surface water and groundwater for potable (ie Public and Private Water Supply) and non-potable (eg industrial, agricultural, recreational supplies). Major potable abstractions are operated by the Water Supply Companies, in this case Thames Water Utilities Ltd (TWUL) and Wessex Water. The latter is responsible for water supply in the south west portion of the Upper Thames catchment plan area particularly the Swill Brook. This area is supplied from boreholes from outside this catchment in the Bristol-Avon area (and will not be dealt with further). Following the passing of the Water Resources Act 1963, with a few minor exceptions, abstractions have required a licence now granted by the NRA. In granting a new licence the Authority must ensure that the abstraction does not have a harmful effect on existing abstraction rights or the water environment. The law has undergone minor changes over the years and the relevant statute is now the Water Resources Act 1991.

Catchment Perspective

- 3.70 Abstraction is the removal of water from rivers or groundwater and may vary in size from the 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. In the Upper Thames catchment, both rivers and groundwaters are used to supply various needs. Abstraction from these rivers is dominated by the requirements of fish farms (99%), whilst public supplies are the main abstractions from groundwaters (see Figure 14).
- 3.71 The major aquifers are the Great and Inferior Oolites (limestones) which form the Cotswold Hills. The Great Oolite is a more important source than the Inferior Oolite. There is some Chalk in the area, but this is restricted to the escarpment of the Marlborough Downs in the south and has only local significance.
- 3.72 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 : Water Resources). Licences enable the NRA to control abstractions by setting limits on the amount which may be taken and the purposes for which the water may be used. When considering new proposals the NRA also has powers to impose conditions to protect the environment.
- 3.73 Abstraction licence inspections are carried out to ensure that the licence holder understands what the licence says and is complying with the conditions of the licence. The frequency of visits depends upon the environmental impact of non-compliance. There are 236 licences in the Upper Thames catchment. In the past 12 months, 66 of the targeted 95 visits were undertaken due to a shortfall in staff resources - in this case all the high impact licences were concentrated on. Targets next year will change to approximately 85 inspections as a result of the introduction of a new national scheme for enforcement.
- 3.74 Table 3.2 shows details of the amounts of water actually abstracted from each type of source for a variety of purposes in 1992. Figures are in millions of litres per day (Ml/d). The total *authorised* abstraction volume is about 170 Ml/d over half of which is for fish farming and is totally returned to the river after use. 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 950 Ml/d. The net abstraction for consumptive uses of 65 Ml/d demonstrates the area carries a generally low abstraction load.



Upper Thames CMP:

Water Abstractions
 >1ML/Day

-  CMP Boundary
-  Rivers
-  Public Water Supply Abstractions (TWUL)
-  Fish Farms
-  Mineral Washing
-  Other
-  Thames-Severn Canal Route

Scale:-
 10km

Figure 14



Table 3.2 - Water Abstraction by Source Type

Use	Sources and actual abstraction (MI/d) in 1992						Total
	Gt. Oolite	Inf. Oolite	Corallian	Gravels	River	Chalk	
Public Water Supply	33.81	19.82	0.00	0.00	0.00	0.32	53.95
Private Water Supply	0.28	0.47	0.00	0.02	0.15	0.03	0.95
Agriculture	1.11	0.06	0.15	0.24	0.23	0.14	1.93
Spray Irrigation	0.00	0.00	0.00	0.10	0.40	0.00	0.50
Mineral Washing	0.00	0.00	0.00	5.30	0.00	0.00	5.30
Industrial Processes	0.04	0.00	0.00	0.17	0.00	0.00	0.21
Fish	0.13	0.00	0.00	0.00	85.21	0.00	85.34
Water Transfer	0.02	0.00	0.00	0.00	0.08	0.00	0.10
Cooling	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Flow Augmentation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Totals	35.39	20.35	0.15	5.83	86.07	0.49	148.28

Environmental Objectives

- 3.75 To manage water resources to achieve the right balance between the needs of the environment and those of the abstractors.
- 3.76 To ensure that licence holders understand and comply with the terms and conditions of the licences.
- 3.77 To ensure that abstraction does not cause any deterioration of water quality or to aquatic or other water-dependent habitats.

EFFLUENT DISPOSAL

- 3.78 This use relates to the disposal of domestic, industrial and agricultural effluents to the river system and to ground. Discharges can affect both the quality and quantity of rivers and groundwater.
- 3.79 The provision of sewerage services is provided mainly by TWUL or their agents but also in the south west portion (eg Swill Brook) of the plan area by Wessex Water. In the latter case, the area is sewered to Malmesbury STW. All discharges (direct to receiving waters) in the catchment are controlled by means of either NRA consents or HMIP authorizations. These consents are legal documents 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 effluents and, if the conditions are not being met, to take action to ensure compliance.

Catchment Perspective

- 3.80 There are 161 consented discharges into the Upper Thames catchment, 78 of which have a maximum consented volume of more than 5 m³/day. The majority of these discharges are from either TWUL or private STWs (see Figure 15 below). The largest discharges by volume are those from the TWUL STWs and fish farms. The larger sewage effluent discharges and the standards they are required to achieve are listed in Table 3.3 whilst information on the total number of discharges is presented in Table 3.4.
- 3.81 Changes to the consents and/or the STWs have been proposed at 13 of the 30 TWUL STWs in the catchment in order to meet the requirements of EC Directives and to provide better protection for the aquatic environment (see Figure 16). The proposed changes have been included in the TWUL Asset Management Plan (AMP 2) submitted to the Office of Water Services (OFWAT). Discussions are taking place between the NRA and TWUL to agree priorities for action on a region-wide basis.

Figure 15 (a)

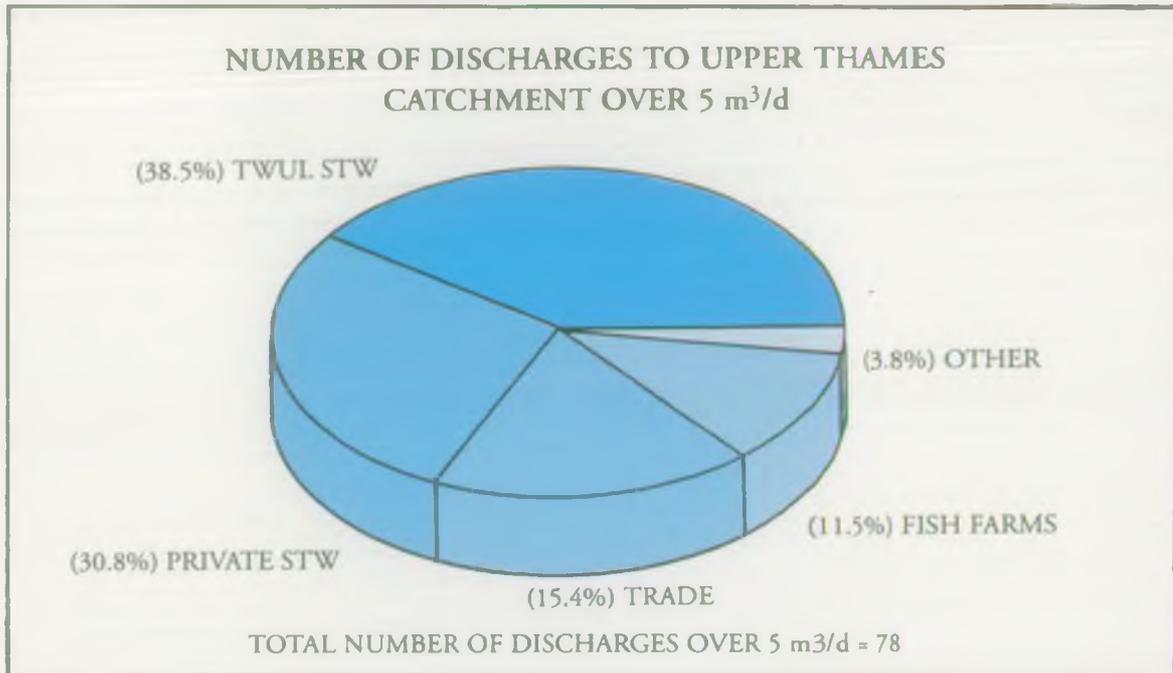


Figure 15 (b)

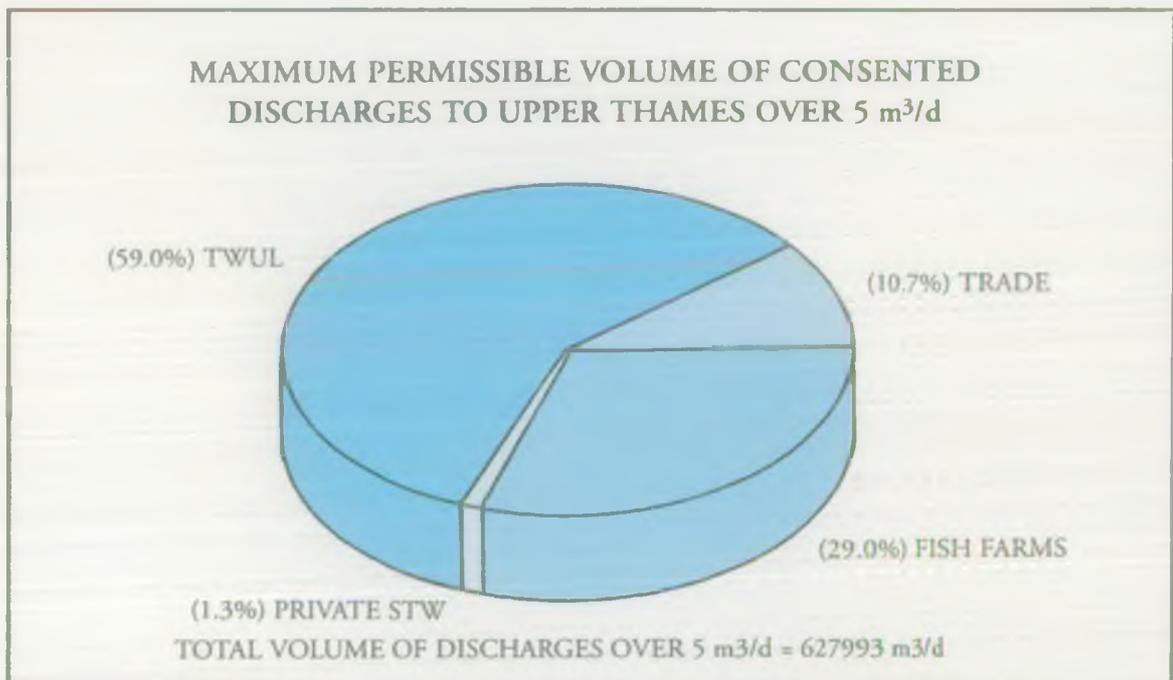
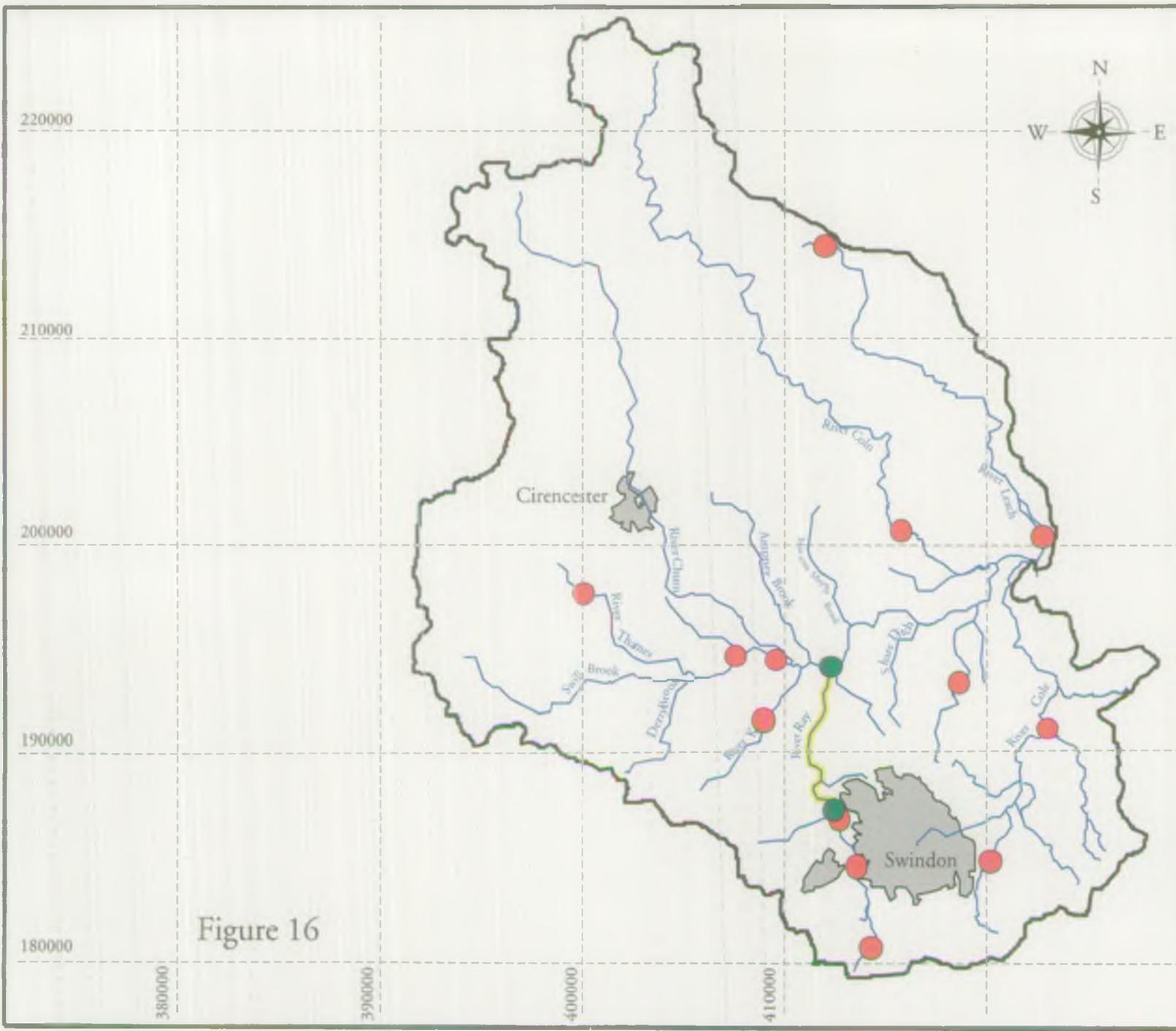


Table 3.3 - Major Sewage Effluent Discharges

Main river and effluent source	Consented Maximum Flow (m ³ /d)	General Consent Conditions (SS/BOD/Amm.N) all mg/l
River Ray		
Swindon	132,900	17/11/5
Wroughton	6,000	30/20/4
Thames		
Cirencester	40,000	25/10/12
Purton	2,835	45/30
Coln		
Fairford	3,000	45/30
Cole		
Highworth	5,700	35/20/10
Shrivenham	6,000	45/30
Leach		
Lechlade	4,975	45/30/5

Table 3.4 - Other Major Discharges

Type	Sub-Type	Sub Total (No.)	Sub Total (Volume m ³ /day)	Total (No.)	Total (Volume m ³ /day)
TWUL STW				30	213,157
Non-TWUL STW				94	1,924
Private	Fish farms	9	182,364		
	Mineral Workings	8	54,287		
	Farms	9	254		
	Other	11	11,159	37	258,064
Totals			248,064	161	473,145



Upper Thames CMP:

Effluent Disposal

-  CMP Boundary
-  UWWT Sensitive Area
-  Dangerous Substances Directive - Monitoring Sites
-  Thames Water STW in AMP2

Scale:-
 10km



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Figure 16

- 3.82 The River Ray is the most heavily used river in the catchment for effluent disposal. During low flows, a significant proportion of the flow of the Ray is made up from effluent from the Swindon STW. Recently the Swindon STW has been upgraded, resulting in markedly improved water quality in the River Ray and a healthier river ecosystem.
- 3.83 In 1993, only Purton STW (TWUL) was recorded by the NRA as failing to meet its discharge consent. Other smaller private STWs also failed. All the other works complied with their consent conditions.

Environmental Objective

- 3.84 To control the discharge of effluent to the water environment in such a way that water quality objectives are achieved, and that nature conservation, fisheries interests and other uses are not compromised.

RURAL LAND USE

- 3.85 Rural land use relates mainly to agricultural policy and the environmental and water resource aspects of agriculture.

Catchment Perspective

- 3.86 The area has experienced a change of land use from pasture to arable farming. It is particularly significant that arable farming occupies a significant proportion of the riparian zone, eg, some 60% in the Cole catchment. It is perceived that this land use change has caused accelerated surface water run-off.
- 3.87 MAFF estimate that the majority of farms in the catchment area are likely to be of good to moderate quality, ie, classified as Grade 3 land. The agricultural land use within the catchment area is principally general cropping followed by grassland. For the cropped areas, around 69% are for cereals, 26% for break crops such as oilseed rape, beans and linseed with horticultural crops, sugarbeet and potatoes are grown to a lesser extent.
- 3.88 The study area falls into three distinct areas in terms of agriculture. The first is the dip slope and valleys of the Cotswolds. The limestone soils of the dip slope are predominantly under arable crops including cereals and oilseed rape. The steeper slopes are under permanent grass with significant areas of woodland in the valley slopes of the Churn and Coln and in several large parks. The valley floors are generally under meadow land for sheep and cattle.
- 3.89 The second major area is the Vale of the Thames, a broad alluvial plain used to graze both sheep and cattle but with significant areas under arable farming where the fertile soils are better drained, such as over terraces and hilly limestone outcrops.
- 3.90 The third area includes the low hill country around Swindon, the Vale of the White Horse and the scarp slope of the White Horse Hills. This is an area of mixed farming depending upon soil, drainage and alleviation of slope. The low hills around Swindon enjoy well-drained, tillable, soils supporting both arable farming and grazing. The Vale of the White Horse is largely under grass with arable farming on the better drained slopes. The scarp slope of the Chalk downs is under permanent grass grazed by sheep but with versatile, well-drained, soils at its foot.

- 3.91 Over the last decade, the area of cropped land has declined by approximately 15% which is particularly due to the decline in cereal production. The introduction of Common Agricultural Policy (CAP) reforms in 1992 also resulted in a decrease in the area of arable land. These reform measures require all but the smallest farms across the country to set-aside 15% (minimum) of land growing cereals, oilseed and protein crops in order to receive Arable Area Payments. On the land that is set-aside, agricultural crops for food production cannot be grown for the duration of the set-aside period. In addition farmers are not allowed to apply artificial fertilisers or pesticides. They are encouraged to manage the land in an environmentally beneficial manner.
- 3.92 Grassland has also declined over the last decade. Cattle numbers, predominantly dairy cattle, have fallen by 26% as have pigs and poultry in the Upper Thames catchment area. In comparison, sheep numbers have increased by 24%.
- 3.93 Approximately 58% of holdings are over 20 ha with the predominant full-time holdings keeping cattle and sheep.
- 3.94 Agricultural areas have the opportunity for grant-aided conservation and enhancement of landscape and wildlife either through Countryside Stewardship or Environmentally Sensitive Areas (ESA). Such voluntary designations have an impact on the management of agricultural land and therefore indirectly on the water environment. The ESA scheme was introduced to help protect those areas where the landscape, wildlife or historic interest are of national importance, from the changes brought about by the development of more intensive farming methods. The scheme encourages farmers to adopt agricultural practices that will help protect and enhance the environment. Farmers enter into management agreements with MAFF and in return receive an annual payment for each hectare of land entered into the scheme. One ESA has been established within the catchment plan area, The Cotswold Hills ESA. This area was designated in 1994 and extends from south west of Chipping Campden, south of Cheltenham to Malmesbury. MAFF aims to maintain and enhance the traditional landscape of the Cotswolds, the wildlife interest and conserve and protect areas of archaeological and historic interest. Farmers who enter the scheme must agree to maintain existing grassland and not to increase the area of arable farm land. They must restrict the use of pesticides and fertilisers and restore dry stone walls using traditional techniques and materials. In addition, farmers are encouraged to revert arable land to extensively managed permanent grassland.
- 3.95 Nitrate Vulnerable Zones (NVZ) require farmers, in areas where water sources are high in nitrate, to observe a programme of compulsory measures such as limiting the timing and volume of organic manure and inorganic fertiliser application. An NVZ has been proposed at Fairford (see section 4.48).
- 3.96 The Great Western Community Forest Project (see Figure 17) covers the southern part of the catchment area. This is one of 12 national forest projects to be undertaken by the local authorities in association with the Countryside Commission and the Forestry Commission. It will cover 20,000 hectares around Swindon and will seek to create a variety of landscapes incorporating farmland, wetland, meadows, lakes and parkland as well as woodland. It is intended to increase tree cover to between 25-35% (2035) in the Community Forest Project area, to conserve and enhance waterside landscapes and habitats and to integrate conservation and recreation opportunities along the rivers. Uptake will be achieved through voluntary land use change under schemes such as countryside stewardship.

Environmental Objectives

- 3.97 To influence and control future rural development in order to protect the water environment and seek enhancement through countryside initiatives.

- 3.98 Realise opportunities for environmentally sensitive agricultural practice in terms of pollution prevention measures, ESA and NVZ.
- 3.99 To de-intensify land use along river corridors to establish, eg, buffer zones and optimize the use of 'set-aside'.

URBAN LAND USE

- 3.100 Urban land use covers urban development, such as the construction of new roads and the growth of urban centres. Development of urban areas such as Swindon can have a significant impact on the water environment, including the river landscape, water quality (in urban streams) and water resources.

Catchment Perspective

Gloucestershire

- 3.101 The northern part of the catchment area is identified as an area of restraint in the Gloucestershire Structure Plan first Alteration. This strategy limits development below forecast growth in recognition of the need to reduce pressures for growth, more appropriately located at Swindon (Wiltshire). The Structure Plan seeks to maintain the roles of Cirencester, Fairford, Lechlade and Tetbury as important employment and service centres (see Figure 18). However, limited residential development is planned in Cirencester, in order to retain its market town character and conserve the historic core. Development boundaries are defined around towns and villages by District Councils in their local plans, eg, Cotswold District Council. With the reduction in activity on US Air Force sites, and the associated transfer of facilities back to the RAF/MOD, there is potential for developments in remote airfield locations such as Fairford Air Base or Kemble. The NRA needs to continue to form robust links with all the relevant parties.
- 3.102 A bypass is planned for Lechlade as well as major improvements to the A417/419 trunk road from Swindon to Gloucester which includes the following schemes:
- Blunsdon Bypass (Wiltshire);
 - Latton Bypass, including the grade separated junctions within the Water Park Spine Road (West and East) - Secretary of State's decision following public inquiry published and contracts for the work are being prepared;
 - Cirencester and Stratton Bypass - as above;
 - North of Stratton to Nettleton Improvement - as above; and,
 - Nettleton to Crickley Hill (Birdlip) Improvement.

A link through the eastern section of the Cotswold Water Park is also proposed to include bypasses for Whelford and Kempsford, and on-line improvements where required.

Wiltshire

- 3.103 Swindon is the main urban centre within the catchment area and the primary focus for new growth. It has a large manufacturing base including motor vehicles, engineering and pharmaceuticals and has undergone major recent expansion. Further development for residential, business and leisure use is anticipated within the urban area whilst protecting key open areas such as those along the River Ray. The sites of the former Great Western Railway workshops have been proposed for major mixed use redevelopment and some development is now taking place.
- 3.104 A major new housing and employment development area is planned to the north of Swindon up to the year 2001 with a capacity to accommodate 27,000 people. Twenty-nine hectares of employment land are proposed together with 8,500 houses. An amenity lake will be provided as part of the Moulden Hill County Park. Some development has also been proposed to the west of Swindon.
- 3.105 Limited growth is planned for Highworth, Wroughton and Cricklade together with employment development at the South Marston industrial estate and airfield.

Environmental Objectives

- 3.106 To influence and control future built development in such a way that the environmental values of the river corridor are maintained and enhanced, and to protect the integrity of the river corridor through urban areas.
- 3.107 To ensure the provision of infrastructure required to protect and enhance the water environment.
- 3.108 To influence and control infrastructure provision in such a way that other uses are not compromised.
- 3.109 Work with the Local Authorities to introduce best practice in surface water source control for some of the major new development areas at Swindon.

MINERAL EXTRACTION AND SOLID WASTE DISPOSAL

- 3.110 Mineral extraction has the potential to affect the catchment through disruption, derogation or contamination of the water environment whilst the works are active. The initial development of a greenfield site and extraction of minerals is liable to involve the discharge of trade effluents from dewatering operations and the disposal of gravel washwaters. (The latter should be recirculated wherever possible). When the working has finished, the range of after uses, eg as solid waste disposal sites, could lead to contamination of ground and surface water. Also, low level restoration increases groundwater vulnerability and therefore adequate measures to protect groundwater quality are required. The County Councils are the planning authority with respect to extraction of mineral resources and must, through their Minerals Plans, secure adequate mineral supplies with minimal environmental cost in accordance with the principles of sustainable development.

Catchment Perspective

- 3.111 The main mineral extraction activity in the catchment area is the extraction of sand and gravel from the Thames Valley. This was begun during the 1920s and is concentrated within the Cotswold Water Park (see Figure 19). The eastern section around Lechlade and Fairford is largely within

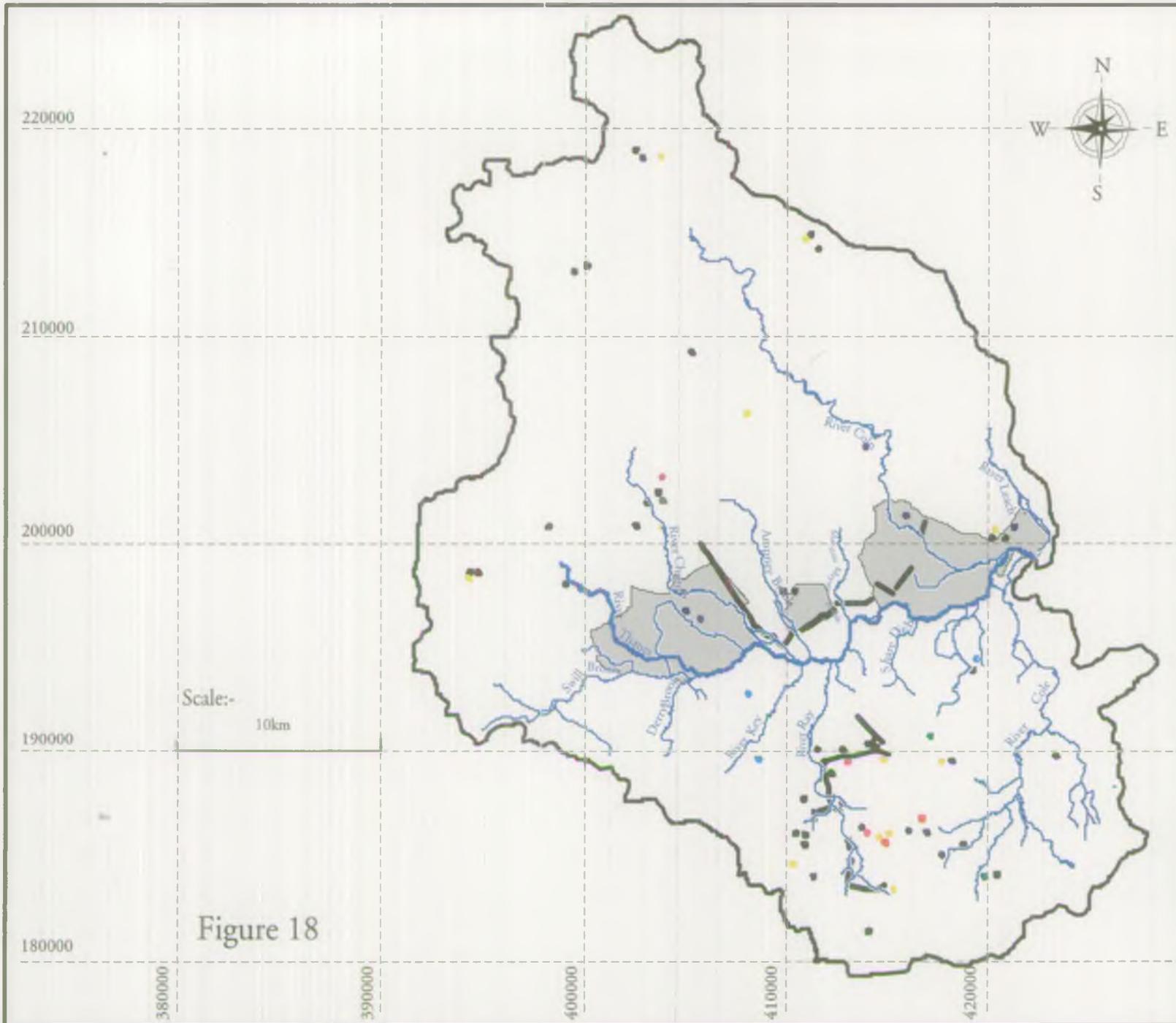


Figure 18

Upper Thames CMP:
Urban Land Use
 (Planning Policy -
 Development)

-  CMP Boundary
-  River Thames
-  Main River
-  Cotswold Water Park Boundary
-  Road Construction/Improvements

Development Proposals

-  Office/Light Industry/Research (Business Use)
-  Industry/Warehousing/Business
-  Employment Use
-  Residential
-  Retail (Warehousing & Reserve)
-  Golf Course
-  Urban Renewal - Mixed Use
-  Recreation
-  Motorists Facilities



3.111 (continued)

Gloucestershire whilst the western section around South Cerney and Ashton Keynes is within Gloucestershire and Wiltshire.

3.112 The gravel reserves have been up to five metres deep under shallow overburden and, due to a high water table and high water quality, extraction sites have become lakes rather than being restored to dry land.

3.113 In the eastern section, extraction has been concentrated to the south and east of Fairford and more recently north of Kempsford. In the west, the main extraction areas have been in the Somerford Keynes-South Cerney-Cerney Wick area, and to the north, south and east of Ashton Keynes.

3.114 The County Councils have concentrated aggregate extraction in the Cotswold Water Park. However, Wiltshire CC has now identified a number of preferred areas for further extraction, in the Latton-Down Ampney-Marston Meysey area (Wiltshire Minerals Local Plan, Consultation Draft 1994). The council has anticipated that these areas may be insufficient to meet forecast needs to 2001 (Wiltshire Minerals Local Plan, 1989). Extraction is currently concentrated in the Ashton Keynes area.

3.115 Gloucestershire CC have recently prepared the Upper Thames Policy Review (1993) which points to the need to identify new resource areas to meet the latest forecast requirements. Extraction is currently taking place in the Shorcote and Cerney Wick area, to the east and west of Fairford and between Whelford and Kempsford within identified Areas of Search. To meet future needs a new and extensive Area of Search at Down Ampney has been identified for sand and gravel extraction in the longer term.

3.116 The County Councils, through the minerals policies of their development plans, seek to maintain a stock of land to provide a seven year supply of aggregates, to minimise the adverse environmental and other impact of mineral extraction, to protect long-term reserves and identified sources, and to ensure the satisfactory reclamation of worked out land. They also set out detailed criteria for the assessment of applications by the planning authorities including consideration of the impact on the water environment.

3.117 Any disposal of trade effluents produced by mineral extraction to relevant waters requires the formal consent of the NRA under the provisions of the Water Resources Act 1991. Adequate measures are required prior to discharge to ensure compliance with any consents issued. These should include settlement to remove suspended solids and measures to prevent oil contamination.

3.118 The 'Threatened Valleys Campaign - Upper Thames Branch' was launched recently. Their aim is to 'fight plans for further widespread sand and gravel extraction along the Upper Thames Valley'. The promoters are concerned that gravel extraction detrimentally and permanently alters landscape and as a pressure group wish to inform planners and politicians of this loss and other impacts.

3.119 The government takes the view (in Minerals Planning Guidance Note 6, 1994) that future sources of aggregates are likely to become increasingly constrained in terms of the areas of the country where they can be acceptably worked. In accordance with the principals of sustainable development less reliance will be placed on the traditional land won sources. This clearly has significant implications for mineral extraction in the Cotswold Water Park.

3.120 There are 22 solid waste disposal sites in the catchment and nearly three quarters of these lie within the Cotswold Water Park. All of the sites except one are private landfill sites most of which are licensed to dispose of inert wastes. Some sites are licensed for commercial, industrial and builders' wastes (see Figure 19).

3.121 The Waste Regulation Authorities for the catchment are Wiltshire, Gloucestershire and Oxfordshire CCs. The WRAs recognise the need to minimise the pollutant effects of waste disposal. The NRA is a statutory consultee of the WRAs and there is close liaison to ensure aquifers and the surface water environment are adequately protected.

Environmental Objectives

3.122 To ensure the sustainable use of resources whilst protecting the existing nature conservation value of the Cotswold Water Park, (especially its nationally important bird populations), maintaining the landscape quality along the Thames and maximise the potential for enhancing the conservation value of the area by influencing restoration of future working, where appropriate, to provide wetland and open water habitat mosaics.

3.123 To control and influence mineral extraction, restoration and after-use and solid waste disposal in other areas of the catchment in such a way that other uses or resources are not compromised.

FLOOD DEFENCE

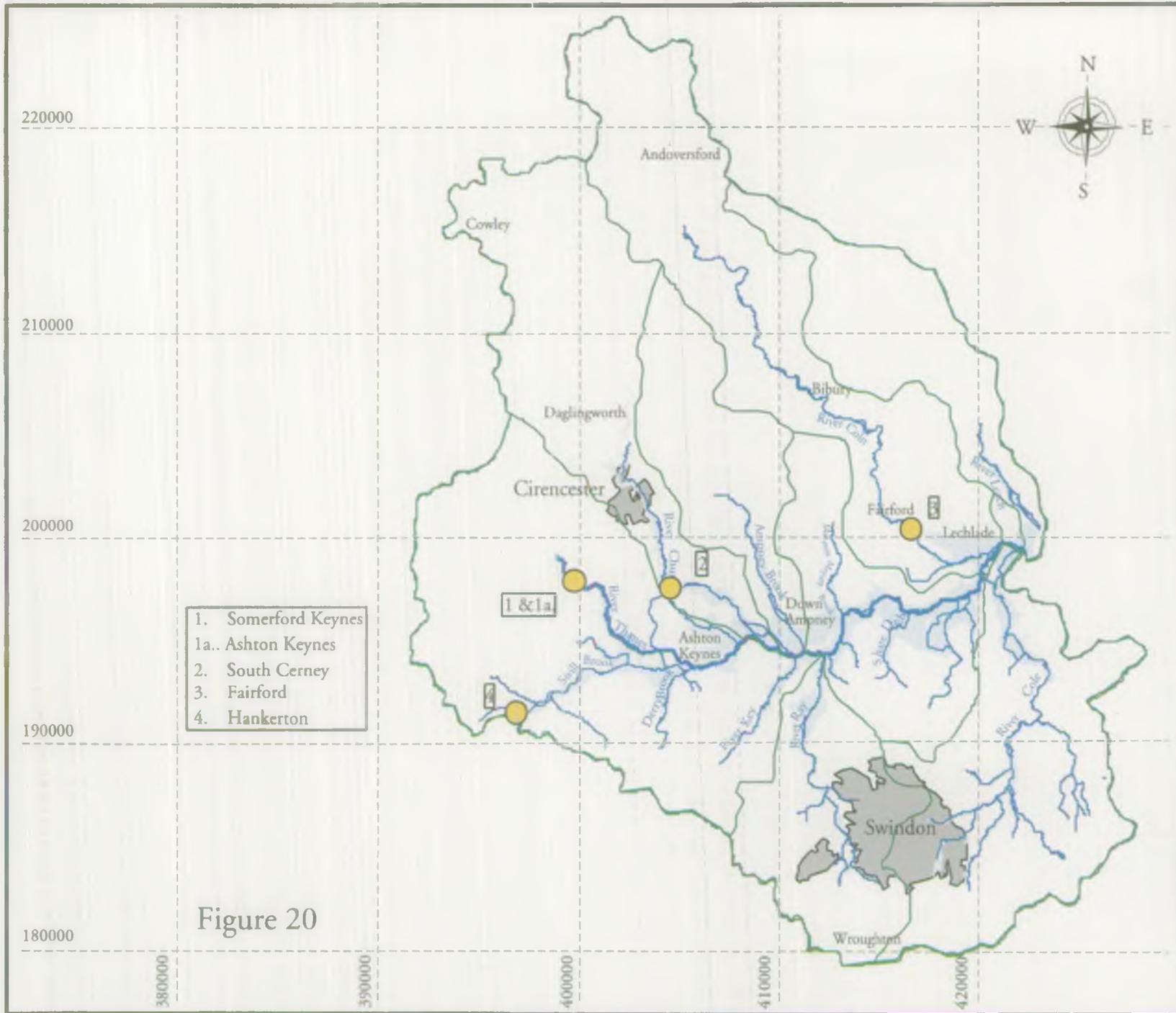
General

3.124 As well as providing a valuable natural resource, rivers are essentially features of natural land drainage processes and serve an important role as conduits for the removal of flood water in order to reduce the risk of flooding. Flood defence is concerned with managing flood risk and encompasses a range of activities, from maintaining the flood-carrying capacity of river channels to providing flood forecasts and warnings.

3.125 Traditionally, flood risk reduction measures involved river management practices which can have an impact on increasing the capacity of the channel to carry flood flows by widening or deepening. NRA undertakes a rolling maintenance and repair programme of river control structures. These measures can have an impact on the river environment and there is the potential for conflict between flood risk management and with uses directly related to the river environment, such as fisheries and ecology. However, a more environmentally sensitive approach to flood defence is now promoted with the full environmental assessment of all 'improvement' schemes and river maintenance operations following strict conservation guidelines.

3.126 The NRA-TR are the primary group involved in flood defence matters, and on designated 'main rivers' the NRA has permissive powers to minimise the risk to existing and future uses (eg, development). District Councils and County Councils have permissive powers to carry out works on 'ordinary' (non-main) watercourses. For flooding from sewers the responsible group is either the local authority or TWUL.

3.127 The NRA normally measure the standard of flood protection in terms of the frequency, at which, on average, (eg 1 in 50 years), it will prove effective. Policies for flood risk management have been developed for the entire Thames catchment based on the flooding frequency and are currently in the process of being implemented. These policies comprise two strands;



1. Somerford Keynes
- 1a. Ashton Keynes
2. South Cerney
3. Fairford
4. Hankerton

Figure 20

Upper Thames CMP:

Flood Defence

-  CMP Boundary
-  River Thames
-  Main River
-  Areas Known to Have Flooded
-  Rural Communities at Risk
-  Gravel Extraction Sites at Risk
-  Sub - Catchment Boundaries



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3.127 (continued)

(i) **Standards of Service (SoS).** The SoS policy sets targets for acceptable frequencies of flooding, such as one in 20 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. However, the system is not being implemented satisfactorily.

(ii) **The Thames Non-Tidal Floodplain Policy.** This policy seeks to limit development in areas which flood more frequently than one in 100 years (on average). Implementation of this policy is the responsibility of local authorities through their development plans. The NRA has a crucial role in providing local authorities with accurate information on the 100 year flood. Under a Memorandum of Understanding (March 1994) 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 inquiry.

3.128 As part of its statutory functions 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.

3.129 The Standards of Service system is a method for the NRA to prioritise its watercourse maintenance activities, eg, flood alleviation, 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

3.130 The low lying areas of the catchment and the areas around the Cotswold Water Park are occasionally subjected to flooding. Figure 20 highlights the areas in the catchment that are known to have flooded in the past and the limits of the main river, over which the NRA has permissive powers for river management. In certain parts of the catchment, flooding is a particular problem and these areas include Somerford Keynes, Ashton Keynes, South Cerney and the Cotswold Water Park.

3.131 In order to ensure that flood risk is minimised the NRA undertakes weed cutting during the summer months, as well as de-silting and clearance.

3.132 As a consequence of development pressure including further mineral extraction in the Cotswold Water Park and the need to provide a sustainable strategy, the Upper Thames catchment has been selected by the NRA as a high priority catchment for surveys related to flood risk assessment in relation to implementing these NRA policies.

3.133 The NRA recognises that irrespective of attempts to minimise flood risk through the implementation of various policies and actions, flooding still represents a risk to human life. In this respect the NRA operates a flood forecasting service in the catchment which uses telemetered information from a number of sites and information from flood defence staff in the field. Flood warnings are issued by the NRA River Control Room at Reading to Thames Valley Police and local authorities. Annual flood warning seminars are also held to review the flood forecasting and warning process.

3.134 The NRA is recognised by the public as the agency which should be contacted when a flooding problem occurs. However, flood management activities on 'non-main' rivers is regarded as a local authority issue as they have the permissive power to deal with maintenance on these watercourses. In some cases, the

3.134 (continued)

NRA does become involved in these issues and disseminates its experience in flood risk management to local authorities and affected communities.

Environmental Objectives

3.135 To seek a reduction in the localised flood risk at Somerford Keynes, Ashton Keynes and South Cerney and investigate the role of the Cotswold Water Park (gravel extraction) in flooding/flood alleviation and storage.

3.136 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.

3.137 To satisfactorily implement the Standards of Service (SoS) policy in the Upper Thames catchment.

3.138 To implement the Thames Non-Tidal Floodplain Policy.

3.139 To improve, as appropriate, arrangements for flood forecasting and warning.

3.140 To continue to disseminate information on flooding and flood protection measures to local authorities who have permissive powers with respect to flood defence on 'non-main' rivers.

SECTION 4

CATCHMENT STATUS

4. CATCHMENT STATUS

INTRODUCTION

- 4.1 This section compares the current status of the catchment with the objectives suggested in Section 3 as well as with standards and targets (where they have been developed) 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 a consultation exercise undertaken by the NRA and analysis of existing data on the catchment.

WATER QUALITY

Introduction

- 4.4 A principal aim of the NRA is to achieve a continuing 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 that all waters are of an appropriate quality for any identified uses.
- 4.5 Water quality improvements cost money and in most 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 schemes to the benefits in deciding whether or not individual schemes should go ahead and in assigning priorities. The NRA is currently developing a methodology for carrying out cost benefit analysis on water quality improvements.
- 4.6 The quality of rivers is assessed both chemically and biologically. Chemical monitoring provides an indication of the conditions of the water at the precise time of monitoring but can miss events occurring between sampling times. Biological monitoring can provide a picture of the long-term quality of surface water and can detect a greater range of problems than will show up in routine chemical monitoring and analyses.
- 4.7 Nutrient concentrations are monitored at key sites and sites where nutrient enrichment could be a problem. High levels of nutrients can alter the ecological balance in rivers and lakes, in some cases causing excessive plant growth and nuisance algal blooms.
- 4.8 The visual appearance of a watercourse is often considered its most important aspect. At present the NRA is studying methods of monitoring and classifying watercourses systemically according to their aesthetic qualities.

- 4.9 Information about water quality is held on the Public Register, which is available for inspection at the NRA Reading Office (Tel: (01734) 535000). The information held on the register includes: water quality classifications, applications for consents and issued consents to discharge, chemical and biological quality information and details of prosecutions.

Surface Waters

Statutory Water Quality Objectives and General Quality Assessment

- 4.10 Up to April 1994, the quality of rivers was reported in terms of the National Water Council (NWC) classification scheme. In this scheme, rivers were assigned to one of six classes based principally on the biochemical oxygen demand (BOD) and the concentrations of dissolved oxygen and ammonical nitrogen. A number of problems with the application of the NWC scheme have been identified and a replacement was sought.
- 4.11 The NRA now uses two principle schemes for the reporting and management of river water quality: the General Quality Assessment (GQA) and the statutory water quality objectives (WQOs) scheme.
- 4.12 The GQA scheme is used to make periodic assessments of the quality of the 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 grades defined by standards for Dissolved Oxygen, BOD and Total Ammonia (see Appendix D). The remaining three windows are still under development and will be applied when available. The GQA chemical quality of watercourses in the Upper Thames catchment is shown on Figure 21. The GQA is designed to be based on a three year period.
- 4.13 Chemical quality objectives for watercourses were formerly set using the NWC system of chemical classification. These were called River Quality Objectives (RQOs). This system could be used to state what chemical quality was required but the link to actual uses of the watercourses was not well defined. Objectives are now being set using a system which links water use to the objectives set for it. For each defined use there will be a range of standards which will be used as targets for the water quality.
- 4.14 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 can 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). The standards for the other uses are still under development. For each stretch of a river, a target RE class will be assigned, including a date by which this standard of water quality should be achieved. Until WQOs are formally established by legal notice served by the Secretary of State, and therefore exist on a statutory basis, they will be applied on a non-statutory basis through a translation of RQOs from NWC grades to appropriate RE classes and target dates. The term RQO should not be confused with its previous usage in association with NWC classification.

4.15 Descriptions of the 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 water quality which is likely to limit coarse fish populations
Unclassified :	Water of bad quality in which fish are unlikely to be present, or insufficient data available by which to classify water quality

4.16 Chemical standards have been set for each of these classes and details of these standards are given in Appendix D.

4.17 River quality objectives have been derived for the Upper Thames CMP using the RE classes. The results are shown on Table 4.1. These objectives have been set taking into account the current and future uses of the watercourses in this catchment. The compliance of the reaches with their objectives are judged for a rolling, three calendar year period. In this report, compliance was judged using the latest three-year-period, 1991-1993.

4.18 Each water quality objective has a target date for achievement. Those reaches which already comply with their objectives have the current date set as their target date. Those reaches requiring some improvement have the target date set for the time when the improvements will take effect. These improvements include capital investment by TWUL at a number of their STWs. This investment is guided by government policy driven by the need to comply with the requirement of EC directives. In addition, a discretionary programme of environmental improvement is to be funded, guided by the NRA.

Table 4.1 River Quality Objectives

WATERCOURSE	REACH	LENGTH km	RQO	ISSUE (See Notes)
AMPNEY BROOK	Source - Poulton Stream	9.3	RE1(1994)	NO
AMPNEY BROOK	Poulton Stream - Thames	3.3	RE2(1994)	1,2
BLUNSDON BROOK	Broad Blunston - Thames	5.1	RE4(1994)	NO
BYDEMILL BROOK	Source - Thames	10.5	RE5(1994)	2
CERNEY WICK BROOK	South Cerney - Thames	5.5	RE3(1994)	1,2
CHURN	Seven Springs - Siddington Mill	25.1	RE1(1994)	NO
CHURN	Siddington Mill - Thames	12.2	RE1(1994)	NO
COLE	Walcor - Tuckmill Brook	13.1	RE3(1994)	NO
COLE	Tuckmill Brook - Thames	14.5	RE3(1994)	2
COLN	Source - Compton Abdale Stream	16.8	RE2(1994)	2
COLN	Compton Abdale Stream - Bibury Fish Farm	15.6	RE2(1994)	NO
COLN	Bibury Fish Farm - Bibury Mill Race	0.3	RE3(1994)	NO
COLN	Bibury Mill Race - Bibury STW	1.0	RE2(1994)	NO
COLN	Bibury STW - Fairford Mill	9.2	RE2(1994)	2
COLN	Fairford Mill - Dudgrove Stream	7.8	RE1(2001)	1,2
COLN	Dudgrove Stream - Thames	1.0	RE2(1994)	NO
DERRY BROOK	Source - Swill Brook	6.7	RE5(1994)	NO
DUDGROVE STREAM	Source - Coln	7.2	RE2(1994)	1
HAYDON WICK BROOK	Haydon Wick - Ray	2.8	RE3(1994)	NO
KEY	Source - Thames	10.7	RE4(1994)	1
LEACH	North Leach - Little Faringdon FFM	27.1	RE2(1994)	NO
LEACH	Little Faringdon FFM - Thames	3.4	RE2(1994)	1,2
LENTA BROOK	Bishopstone - Cole	6.5	RE1(1997)	2
LENTA BROOK EAST	Lenta Brook - Cole (E)	2.5	RE5(1994)	NO
LERTWELL BROOK	Ashbury - Tuckmill Brook	2.1	RE5(1994)	NO
LIDEN BROOK	Liddington - Cole	8.2	RE2(2001)	2
LYDIARD BROOK	Source - Rodbourne Tip	3.7	RE3(1994)	NO
LYDIARD BROOK	Rodbourn Tip - Ray	0.7	RE4(1994)	NO
MARSTON MEYSEY BROOK	Source - Thames	7.3	RE2(1994)	NO
RAY	Source - Wroughton Ditch	4.5	RE2(1994)	NO
RAY	Wroughton Ditch - Swindon STW	4.5	RE5(1994)	NO
RAY	Swindon STW - Haydon Wick Brook	4.2	RE5(1994)	2
RAY	Haydon Wick Brook - Thames	7.8	RE3(1994)	2
SHARE DITCH	Source - Thames	6.1	RE4(2001)	1,2

Table 4.1 (continued)

WATERCOURSE	REACH	LENGTH km	RQO	ISSUE (See Notes)
SOUTH MARSTON BROOK	Source - Cole	5.2	RE2(1994)	NO
SWILL BROOK	West Crudwell - Flagham Brook	10.0	RE3(1994)	NO
SWILL BROOK	Flagham Brook - Thames	3.6	RE2(1994)	NO
THAMES	Source - Swill Brook	11.2	RE3(1994)	NO
THAMES	Swill Brook - Cerney Wick Brook	3.5	RE2(1994)	1
THAMES	Cerney Wick Brook - Key	4.0	RE2(1994)	1,2
THAMES	Key - Ray	1.4	RE2(1994)	NO
THAMES	Ray - Share Ditch	7.3	RE3(1994)	2
THAMES	Share Ditch - Bydemill Brook	3.8	RE3(1994)	NO
THAMES	Bydemill Brook - Coln	2.9	RE3(1994)	2
TUCKMILL BROOK	Idstone - Shrivenham STW	7.1	RE3(1994)	NO
TUCKMILL BROOK	Shrivenham STW - Cole	2.6	RE5(1994)	1,2
VENEYMORE DITCH	Leach - Leach (bifurcation)	2.7	RE2(1994)	NO
WATERLOO DITCH	Source - Cole	4.2	RE2(1994)	NO
WESTROP BROOK	Source - Bydemill Brook	3.2	RE5(1994)	1,2
WROUGHTON DITCH	Wroughton STW - Ray	0.9	RE5(1994)	1,2

Note: ISSUES 1: CAPITAL INVESTMENT 2: FURTHER INVESTIGATION REQUIRED NO: no issue

EC Directives

4.19 Three EC Water Quality directives apply to the catchment.

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

4.20 The Fisheries Directive (78/659/EC) applies to designated sections which are marked on Figure 22. This directive is concerned with ensuring that water quality in the designated reaches is capable of supporting certain types of fish. Two fish types are incorporated into the directive; (i) salmonid, which includes trout, grayling and salmon, and (ii) cyprinid, which includes coarse fish species, such as roach and perch.

4.21 Approximately half of the river length in this catchment is designated under the directive. Of the 22 designated reaches, 11 are designated as salmonid fisheries and 11 as cyprinid fisheries. Designated reaches on both the River Ray and the River Thames downstream of Swindon STW failed to comply with the water quality standards in the directive during the three year period 1991-93. As described earlier, improvement work has been carried out at Swindon STW and this will ensure that these reaches comply in future years.

4.22 The River Thames from Ashton Keynes to Eysey (cyprinid), the River Leach from East Leach to Little Faringdon (cyprinid) and the Ampney Brook from its source to the Thames (salmonid) have been recommended by the NRA-TR for designation by the DoE under the directive. This should help to ensure that the current water quality in these reaches is maintained. The locations of the sections proposed for EC designation are also shown on Figure 22.

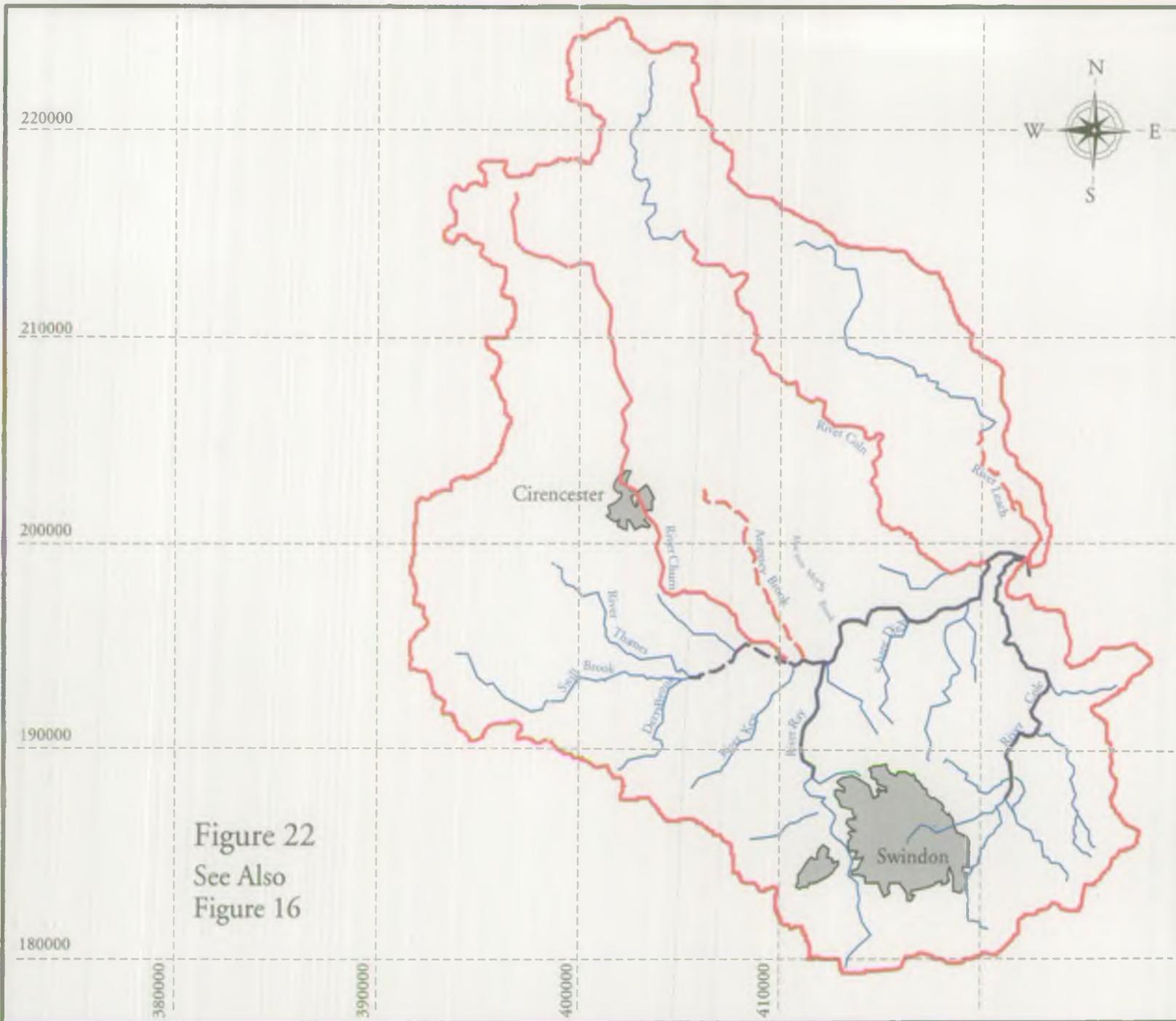


Figure 22
See Also
Figure 16

Upper Thames CMP:
**Water Quality:
(EC Fisheries Directive)**

CMP Boundary

Designated Reaches

- Salmonid
- Cyprinid

Proposed Reaches

- Salmonid
- Cyprinid

Scale:-
10km



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

- 4.23 This directive provides for the control of discharges of certain dangerous substances into the aquatic environment. 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. They include specific organic compounds such as pesticides and solvents, and specific metals which are discharged into the sewerage system and STWs.
- 4.24 The concentration of cadmium is monitored in the Thames at Eysey downstream of Cricklade STW and those of both cadmium and mercury are monitored in the Ray at Moredon Bridge downstream of Swindon STW. Both cadmium and mercury are classified as dangerous substances under the Directive. Both sites comply with the requirements of the Directive and data collected to date indicate that cadmium and mercury are rarely detected in these discharges.

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

- 4.25 The Urban Waste Water Treatment Directive sets priorities for the treatment of sewage according to the volume of the discharge and the type and sensitivity of the receiving waters. Receiving waters which may be subject to eutrophication problems are to be designated as sensitive areas (eutrophic) by the DoE under the Directive and, phosphate removal at STWs discharging into these receiving waters is to be considered.
- 4.26 The River Ray (see Figure 16) has been designated by the DoE as a sensitive area (eutrophic). As the recent improvements in effluent quality at the works have not fully taken effect, the decision on whether phosphate stripping is required will be taken only once the state of river stabilises and the effects on the river (flora) are known. There are no plans to remove phosphate from the final effluent discharged into the Ray from Swindon STW at present.

Biological Status

- 4.27 The health of the river ecosystem is monitored using aquatic macroinvertebrates. These are the small animals which inhabit the river ecosystem (and are generally sampled on the bed of the river). Macroinvertebrates respond to a variety of changes in water quality such as: organic pollution, persistent toxic contaminants and acute spillages. As the macroinvertebrates are present 24 hours a day they may be used to detect the changes that may be missed by spot chemical sampling.
- 4.28 Macroinvertebrate samples are collected using standard techniques, eg, the three-minute kick-sweep technique where suitable. Families found during sorting are scored in accordance with their tolerance to pollution using a system established by the Biological Monitoring Working Party (BMWP). A high BMWP score indicates good water quality whilst a low score represents poor water quality.
- 4.29 Care must be taken interpreting macroinvertebrate data because populations vary according to micro-habitat, eg, whether the river has a rocky or muddy bed. In some cases low BMWP scores may be a natural phenomenon rather than a consequence of pollution. To assist in the interpretation of biological data, a computer program has been developed (known as RIVPACS) which predicts the BMWP scores for an unpolluted stretch of river taking the local physical conditions into account. This system allows

4.29 (continued)

an accurate comparison to be made between the unpolluted and current state of the waterway and takes the physical characteristics of the river into account.

4.30 The reaches which failed to meet their predicted BMWP scores are shown on Figure 23 and biological scores are listed in Appendix D. The streams in the northern half of the catchment mostly achieve high BMWP scores which indicates they have good water quality. Scores in the Upper Churn are particularly high indicating exceptionally good water quality. Many reaches in the smaller brooks fail to meet their predicted BMWP scores. Sections of watercourses which failed to meet their targets or which have shown large changes in the biological scores over the last five years are listed in Table 4.2.

Table 4.2 - Sections of Watercourse Having Poor Biology or Showing a Large Change in Biological Status Over the Last Five Years

Watercourse	Biological Issue	Cause	Comment
Ray above Swindon STW	Poor biology	Urban run-off and pollution	In urban areas intermittent pollution in small streams is a common problem
Ray below Swindon STW	Poor, but improving biology	Impacts of urban pollution; improvements in Swindon STW	Biological health in the Ray has improved as a consequence of improvement to the Swindon STW
Key	Poor biology	A possible cause is Purton STW	Further investigation into the cause of the poor biology is required
Swill and Liden Brooks	Fluctuating biological scores	Unknown	Further investigation is required
Bydemill Brook and Veneymore Stream	Declines in biological quality since 1990	Unknown	Further investigation is necessary
Ampney and Marston Meysey Brooks	Biological improvements since 1990	Higher flows	Both these streams dried up in the drought of the 1990s. Their ecosystems have now recovered
Churn at Cerney Wick	Improvement since 1990	Higher flows	The higher flows since 1990 have resulted in a healthier ecosystem in the Churn

Bacteriological Monitoring

4.31 Total and faecal coliforms are indicators of the level of contamination by faecal material from animals and humans. These bacteria may be from a number of sources including point sources, such as STWs and spillages from agricultural slurry tanks, and diffuse run-off from urban areas and farmland. The results of bacteriological monitoring of rivers are presented in Appendix D, and on Figure 23.

4.32 Levels of bacteria are of particular concern in terms of the health of people who come into contact with the water. The health implications of the bacteriological conditions in the catchment are the responsibility of the local authorities' Environmental Health Officer, and not the NRA, (see Section 3 Amenity & Recreation).

Nutrient Status

- 4.33 Nutrients are essential to the normal functioning of ecosystems. However, in excessive quantities, nutrients may cause nuisance aquatic plant (macrophytes) and algal growths. The human activities which tend to cause excessive nutrient levels are agricultural practices and effluent discharges.
- 4.34 Excess nutrient problems are of concern in the catchment. As mentioned earlier in this section, the River Ray downstream of the Swindon STW is classified as a 'Sensitive Area' (eutrophic). Macrophyte surveys of the Ray are being undertaken to assess the scale of the eutrophication problem and some macrophyte data have already been collated as part of the routine river corridor surveying programme.
- 4.35 Intensive algal surveys of the River Thames are planned to continue to build on the data already collected. These surveys will provide information for the south west Oxfordshire reservoir proposal, the Severn-Thames Transfer and the implementation of the Urban Waste Water Treatment Directive. Initial results of the algal surveys indicate that there is a substantial increase in algae in the River Thames downstream of the River Ray.

Pollution Control and Prevention

- 4.36 The number of recorded pollution incidents has grown over recent years. This increase appears to be attributable to a range of factors, such as improved communication facilities (eg setting up of the 'pollution hotline') and greater environmental awareness amongst the general public, rather than a genuine increase in pollution incidents.
- 4.37 The NRA divides pollution incidents into three classes, major, significant and minor, depending on their severity. The criteria used to assess the class of incident are given in Appendix D. During 1992-93, there were 285 incidents recorded, 19 of which were classed as significant. There were no major incidents.
- 4.38 Details of all the incidents recorded over 1992-93 are presented in Table 4.3.

Table 4.3 - Pollution Incidents (1992-93)

Pollution Type	Thames Direct	Leach	Coln	Ampney Brook	Churn	Ray	Cole	Total
Oil	8	2	5	0	8	30	31	84
Sewage	30	0	7	1	4	9	11	62
Agriculture	20	0	3	0	0	7	6	36
Chemical	3	0	0	0	6	11	5	25
Natural	10	0	6	0	3	2	5	26
General	7	1	3	0	4	24	11	50
Not known	0	1	1	0	0	0	0	2
Total	78	4	25	1	25	83	69	285

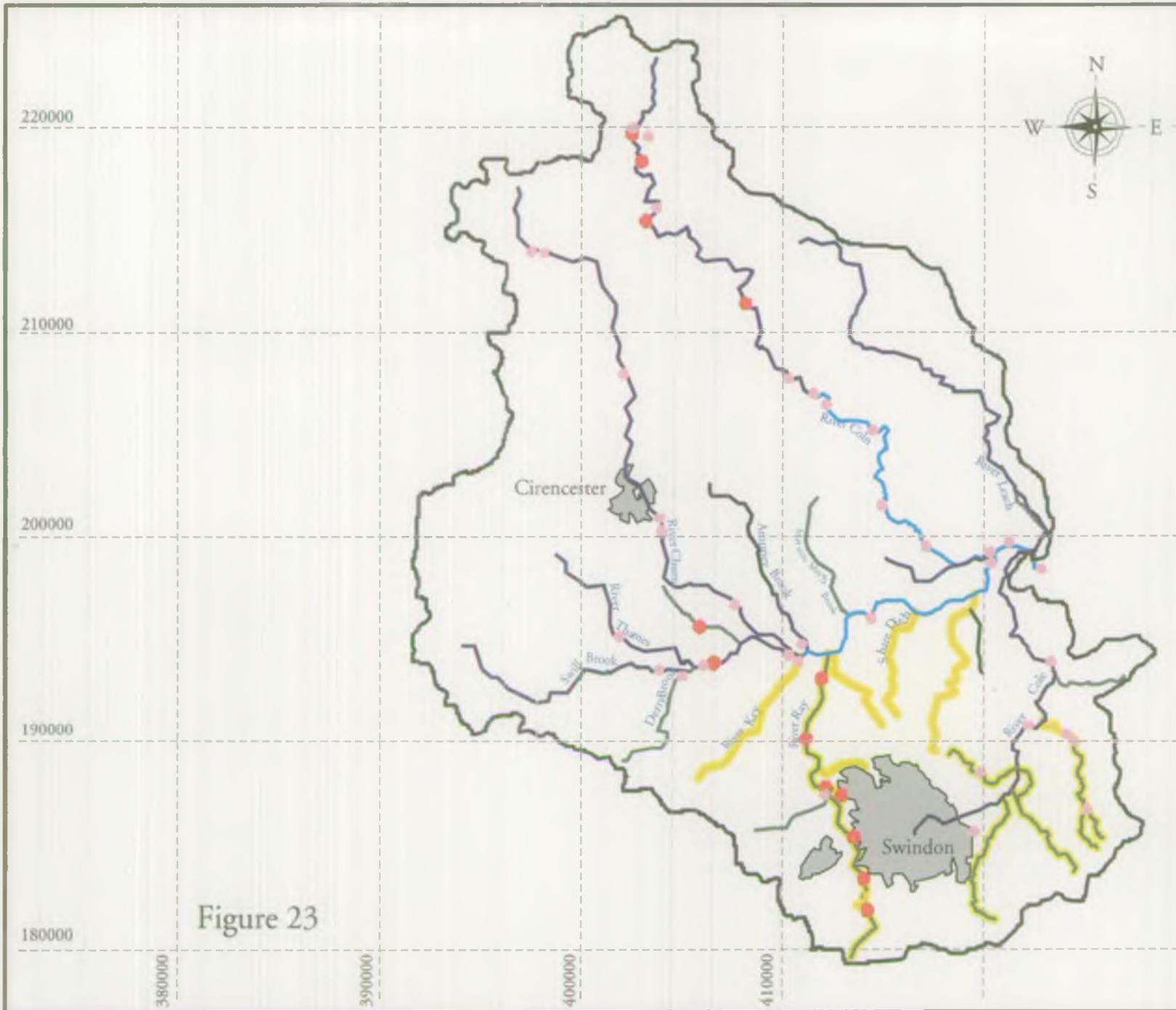
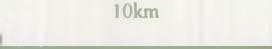


Figure 23

Upper Thames CMP:

**Water Quality
(Biology)**

-  CMP Boundary
- Biological Monitoring Working Party Score (1992-93)
 -  151+ High Quality
 -  101-150
 -  51-100
 -  16-50
 -  0-15 Poor Quality
 -  Reaches not Meeting Predicted Scores
- Bacteriological Quality Geometric Mean Values for E.Coli /100ml (1991-94)
 -  <100
 -  100-2000
 -  >2000
- Scale:-




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4.39 The NRA operates a proactive approach to pollution control and prevention. There are four strands to this approach:

(i) **Farming and Agriculture:**

- NRA has a programme of periodic farms visits throughout the catchment. The programme is structured on sub-catchments where all farmers receive an advisory visit. Nearing completion are campaigns on Elcombe, Lydiard and Shaw Brooks (Upper Wiltshire Ray) and Lenta and Lertwell Brooks (River Cole). These will be followed by other sections of the River Cole, Churn and Swill Brook;
- NRA staff provide advice on Grant Aid schemes for farm improvements to ensure adherence to the Control of Pollution (Silage, Slurry and Agricultural Fuel Oil) Regulations (1991);
- Herbicide use near waterways is controlled by regulations which are administered by the NRA;
- Groundwater Protection Zones are being established by the NRA and this protection concept will provide a further means of controlling pollution in certain areas and will be targeted in addition to surface water catchments in the future;
- The NRA also raises awareness of water pollution prevention by giving regular presentations to farming and community groups;
- The introduction of, and control created by, the Control of Pollution (silage, slurry, and agricultural fuel oil) Regulations 1991.

(ii) **Industry:**

- The two key centres are Cirencester and Swindon. Due to the high proportion of incidental pollution in Swindon, a mail shot was made to all businesses in 1992. Some 11% responded and subsequently a number of trading estates have been targeted including Kembrey, Elgin & Hawkesworth, Cheney Manor and Liden in 1995/6. Love Lane, Cirencester is included in the 1994/5 programme.
- NRA staff seek to raise awareness amongst industry of water pollution prevention by free distributions of 'NRA Pollution Prevention Guidelines' (and see (iv)).

(iii) **Other Activities:**

- NRA staff target a number of other activities in the catchment as part of their advisory visits and inspection programme, including STWs, marinas, Ministry of Defence installations (Wroughton, South Cerney, Fairford, Kemble, and Little Rissington) and mineral extraction sites (1995/96).

(iv) **Public Awareness & Education:**

- Part of the pollution prevention strategy involves the dissemination of information to the general public. This includes NRA staff speaking to various groups, including schools and community groups, and the publication of best practice guidelines and information videos. Cotswold DC chair an environmental forum with delegates from NFU, CLA, EN, NRA, etc, as do Thamesdown BC. The NRA would encourage this approach to be repeated by other authorities.

4.40 Information on recent prosecutions and fines is listed in Appendix D.

Groundwater Quality

- 4.41 Groundwater within the catchment is generally of very good quality and provides an important resource. Several public supply abstractions are sited in the catchment and significant quantities of water contribute to river flows, particularly in the north of the catchment.
- 4.42 The catchment is largely rural, with the main urban area of Swindon to the south. Rural areas are largely unsewered and there numerous discharges of sewage effluent into the ground in the catchment.
- 4.43 Industrial activities, such as gas and engineering works, eg the former British Rail engineering works in Swindon, 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 and airfield run-off can contribute to the degradation of groundwater quality, for example when de-icers and herbicides are washed into the ground.
- 4.44 The NRA have a duty under the Water Resources Act 1991 to monitor and protect the quality of groundwater; to assist in this duty, the NRA have published a document entitled 'Policy and Practice for the Protection of Groundwater' (PPPG). 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. 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, for example in the Swindon area airfields at Kemble, and Fairford; use of soakaways (road and rail drainage), effluent discharges and agricultural activity. The NRA is currently in discussion with the Ministry of Defence regarding airfields in the catchment at Fairford, Kemble, South Cerney and Wroughton.
- 4.45 In addition, maps are being published which give an indication of groundwater 'vulnerability' in terms of the aquifer's importance and the soil characteristics. The limestone areas of the Upper Thames are particularly vulnerable where pollutants can spread rapidly through fissure flow. Vulnerability maps at a scale of 1:100,000 covering the Upper Thames catchment are due for release by 1995/96. A UK coverage map is provided with the PPPG document showing general categories of vulnerability. This UK map (1:1,000,000 scale) has already been published.
- 4.46 Mineral extraction by sand and gravel workings has been concentrated within the Cotswold Water Park, often with subsequent restoration to lakes. Clay extraction sites in the south of the catchment, particularly in the Swindon area, have largely been restored by landfilling of wastes. Special precautions will be required for any proposed mineral extraction of areas within or near sites where groundwater may have been affected as a result of present or former use, eg, airfields, sewage works and landfill sites. Such sites may have an impact on the proposed after use, particularly in cases of proposed restoration to wetlands or lakes. Waste disposal sites which have taken putrescible wastes may generate leachate which poses a risk to groundwater.
- 4.47 A Regional Appendix regarding mineral extraction is available outlining the application of the policies as they affect aquifers in the Upper Thames area. In this area, a considerable proportion of the base flow of rivers, particularly those in the north, is provided by groundwater. Consequently the management of groundwater and surface water quality is inextricably linked.

- 4.48 There are no Nitrate Sensitive Areas in the catchment. There is, however, a proposed NVZ associated with the public supply abstraction at Fairford. This represents compliance with the EC Nitrate Directive (91/676). Under the control of MAFF, it is intended to reduce water pollution by nitrates from agricultural sources. A consultation period on proposed NVZs ended on 31 August 1994.
- 4.49 There are no statutory water quality objectives (SWQOs) 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 20 sites in the Upper Thames catchment, although the programme is undergoing review at present.

Water Quality Issues

4.50 The water quality issues are therefore as follows:

- Several reaches require capital investment at STWs to allow the quality to reach or be maintained at their river quality objectives;
- Several reaches require further research on their water quality before the river quality objectives can be confirmed;
- The River Ray below Swindon STW currently fails to meet its EC Fisheries Directive water quality standard. However, in the future, the River Ray is expected to meet these targets as a consequence of improvements to the Swindon STW. The need for phosphate stripping at the works also needs to be assessed in light of the 'sensitive area' designation of the River Ray downstream of the works;
- The NRA has recommended that the length of river designated under the EC Fisheries Directive is increased. Additional lengths of river recommended for designation include sections of the Rivers Thames, Leach and Ampney Brook;
- Biological monitoring indicates that the quality of groundwater fed streams has improved since 1990 as a consequence of higher flows;
- Sections of the Rivers Ray, Key, Shill, Liden, Bydemill and Veneymore Brooks have poor biology which indicates they are polluted. The causes of the pollution are unknown except in the case of the River Ray;
- Intermittent pollution is an ongoing management issue and urban sources of pollution are a particular problem on the River Ray;
- An NVZ has been proposed around the abstraction site at Fairford;
- Groundwater quality issues include: the redevelopment of the former British Rail engineering site at Swindon and the past, present and future use of airfields in the Upper Thames area.

WATER RESOURCES

- 4.51 In managing water resources, the NRA seeks to achieve a sustainable balance between the needs of the environment and the needs of Public and Private Water Supply. The NRA must have particular regard for the statutory duty of the water companies to supply water, whilst at the same time seeking to further the conservation and enhancement of the natural water environment.

- 4.52 The Water Resources Act 1991 sets out a system of Abstraction Licensing (see Section 3 : Water Abstraction) which allows the NRA to control the abstraction of water. The Act also sets out what matters 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 etc) and describes the procedures which must be followed when applying for a licence.
- 4.53 In response to its duties under the Act, NRA-TR has developed a set of formal policies for handling applications for licences and changes to existing licences. These policies do not in general allow the abstraction of water from rivers (or nearby groundwaters) for consumptive use in the summer months, and encourage the development of winter storage for such uses as spray irrigation. It is also unlikely that the NRA would grant new licences authorising abstraction for continuous major abstractions (such as public supply).
- 4.54 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 our understanding of the flow levels and regimes required to sustain all the essential elements of a healthy river ecosystem and use this knowledge in assessing the impact and acceptability of proposed abstractions.
- 4.55 The extended dry period from 1989-92 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 our control. The NRA is revising a methodology for assessing the severity of low flow conditions resulting from excessive, but authorised, abstraction. The revised methodology has been applied to the Churn and Ampney Brook.
- 4.56 Water resources to meet the demands of public water supply are particularly influenced by major centres of demand at Swindon and Cirencester. In meeting existing demands, local resources are supplemented by conjunctive management with imported water resources mainly from Farmoor Reservoir in Oxfordshire and also from Axford on the River Kennet. Farmoor Reservoir is a major strategic water resource to the area and is used conjunctively with other sources (see Figure 24).
- 4.57 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 anticipated needs of public water supplies, industry and agriculture in the region. It shows that existing resources can sustain planned levels of local development in the Upper Thames area as identified by existing Local and County Council structure plans (including the Swindon Northern Sector Developments).
- 4.58 Managing growth in demand for water is a critical feature of the strategy for the longer term. For example, the management and control of losses through leakage from mains and encouraging more efficient use of water at work and at home can significantly affect the growth in demand for water. It may be possible to delay the need for major new strategic water resource schemes or perhaps avoid them altogether for the foreseeable future. However, the NRA and TWUL must work together to establish the practicalities and full extent of economic leakage control.
- 4.59 If growth in demand cannot be contained the strategy identifies a number of schemes to meet future demands two of which may impact and benefit the Upper Thames area. These are:

4.59 (continued)

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

4.60 These schemes would be required to support increasing demand for water principally in the Upper Thames and London supply areas in the region. However, their successful promotion should not be seen as a foregone conclusion. Any strategic scheme is likely to have significant environmental impact as well as benefit which will need to be thoroughly assessed. Experience of the development of other strategic resources has shown that some schemes may take up to 20 to 25 years from conception to implementation.

4.61 The development of new strategic water resource schemes may provide an opportunity to vary the operation of existing licensed resources in cases where abstractions are proved to adversely affect the water environment.

4.62 It is the intention of Gloucestershire CC to include policies which seek to protect water resources from over use in the Second Review of the Structure Plan.

4.63 Figure 24 shows the broad movements of water for public water supply within the catchment. Supplies from the strategic source at Farmoor are variable but can be up to 40 Ml/d. The remaining groundwater sources are used conjunctively with Farmoor which allows TWUL to operate the water supply system flexibly.

Water Resources Issues

4.64 The water resources issues relevant to the Upper Thames are therefore as follows:

- managing growth in demand, ie, through leakage control and metering etc;
- water resources development options such as the proposed reservoir or the Severn-Thames transfer;
- continued research into ecologically acceptable flows; and,
- effective NRA guidance to local planning authorities.

PHYSICAL FEATURES

4.65 Physical features are those characteristics of watercourses which can be expressed in physical terms and do not relate to either the quantity or quality of water. It includes features such as channel morphology, water movements etc. For the purposes of this report, the physical features category also includes any relevant land or water management practices such as flood defence, environmental enhancement etc.

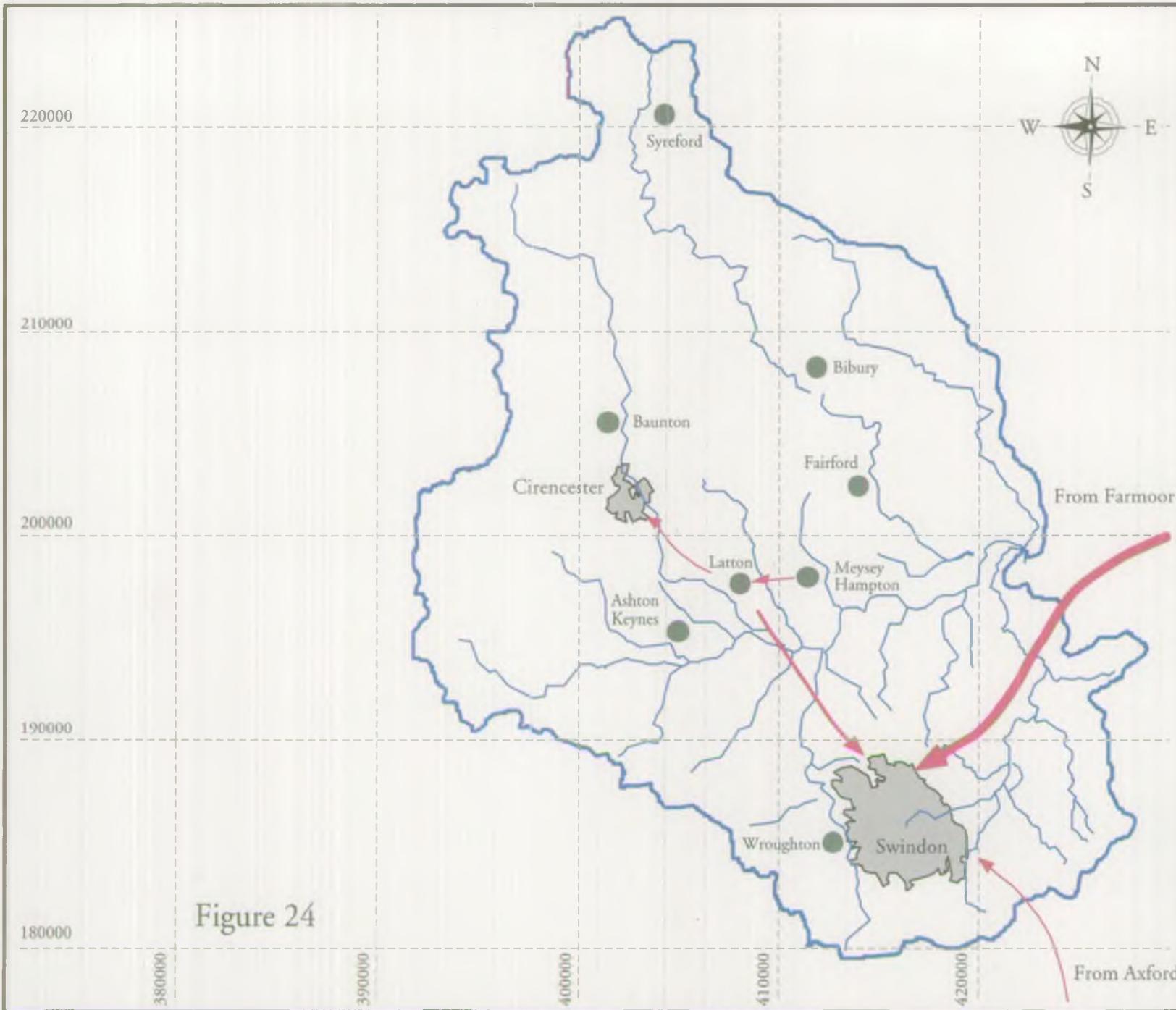


Figure 24

Upper Thames CMP:

Water Resources

-  CMP Boundary
-  River Thames
-  Main River
-  Urban Areas
-  Public Water Supply Abstractions (TWUL)
-  Water Movements

Scale:-
10km




Flood Defence

- 4.66 The NRA have developed a system for assessing the level of protection an area should be given against flooding known as the 'Standards of Service for Urban and Rural Flood Defence' (SoS) as discussed in section 3.124. Five land use types are used to decide the required level of service, ranging from A (heavily urbanised) to E (non-intensive agriculture). Associated with each land use class is a target which specifies the maximum acceptable frequency of flooding. The standards of service for designated areas in the catchment are listed in Appendix D.
- 4.67 There are a number of problems in applying Standards of Service: (i) an area may not meet its target because the cost of works to ensure that the target is met may exceed the calculated 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.
- 4.68 It is better to prevent flooding than to solve problems later. However, the relevant authority for controlling development in the floodplain is not the NRA but the local planning authority. A flood policy, known as the Non-Tidal Floodplain Policy, has been adopted by the NRA and involves close liaison with the local planning authorities to ensure its implementation. This policy precludes most development in areas which flood more frequently than once in a hundred years, in order to protect the catchment's flood storage areas and routes. Development which is allowed in these areas must meet the following criteria:
- flood flows must not be impeded;
 - the storage capacities associated with floodplains must not be reduced;
 - 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; and,
 - environmental impacts must be kept to acceptable levels.

Hydrological and hydraulic studies are necessary to help identify the areas covered by this policy.

- 4.69 This approach is further outlined in the DoE circular 30/92 which encourages local planning authorities and NRA to liaise closely on flooding and surface water run-off matters. The aim is to ensure that flood defence risks of development are an integral part of the decision-making process undertaken by local planning authorities on relevant planning applications. In this respect the NRA has a responsibility to prepare surveys under Section 105 of the Water Resources Act 1991 to define the nature and extent of flood risks. The preparation of such surveys is the subject of the recent 'Memorandum of Understanding' between representatives of local planning authorities and the NRA referred to in 3.127.
- 4.70 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.

- 4.71 There are a number of local flooding issues. Some of these do not directly involve the NRA because the issues do not occur on designated main rivers, local authorities have the permissive powers for the affected watercourses. However, the NRA has become involved in flood management on these minor watercourses through encouraging discussion between the local authorities and the communities affected.
- 4.72 The role of the Cotswold Water Park in flooding is unknown as a consequence of a lack of understanding of the hydraulic processes in the Park area. This lack is of concern given that further mineral extraction is planned and that mineral workings are thought to have resulted in properties being subject to increased flooding risk.
- 4.73 The NRA has adopted the flood warning target that the police will be informed four hours in advance of an event in rural areas, and two hours in urban areas.
- 4.74 The following is a summary of the flooding related issues:
- the standards of service concept is difficult to apply;
 - insufficient data are available to implement current NRA policies successfully;
 - there may be problems in applying strict environmental criteria to the Standards of Service approach;
 - the SoS system at present does not necessarily allow for sites where frequent inundation/high water levels are desirable for nature conservation purposes;
 - there are localised flooding issues but these are generally the responsibility of the local authorities and not the NRA; and,
 - the role of the Cotswold Water Park in flood storage and alleviation terms is unknown.

Riverine Environment and Fisheries

- 4.75 The quality of the river environment is important in terms of fisheries, conservation and amenity use. A rigorous methodology for assessing the environmental value of the river has not yet been developed, however, the NRA is undertaking a River Habitat Survey which is being piloted at present and aims to assess the 'naturalness' and physical characteristics of rivers. SERCON is another research project involved with developing a classification scheme based on plant and animal communities. Therefore, at present specific targets for the riverine environment are difficult to set, but from a conservation viewpoint they should aim to achieve a healthy, diverse aquatic and riparian habitat supporting a wide range of flora and fauna.
- 4.76 One method the NRA uses to obtain general information on riverine environments is the River Corridor Survey. These surveys give a total overview of the distribution of plant communities along a river system, identify the more diverse and impoverished reaches, and give detailed reach information that can be used when assessing planning applications and land drainage consent applications. The rivers Ray, Cole, Churn and the Ampney Brook have all been surveyed in the last two years and the Thames and Coln will be surveyed in 1994/95.

- 4.77 The NRA has developed targets for fisheries based on the amount of fish (biomass) found in a certain area. Two targets have been set; one for EC designated salmonid waters, the other for EC designated cyprinid waters. Biomass is sampled during routine fisheries surveys which are undertaken on a rolling programme basis throughout the Thames catchment. Individual water courses have all been surveyed in the last five years, and individual watercourses are now being programmed for fishery surveys to coincide with the production of Catchment Management Plans. The reasons for failing to meet the biomass targets are listed in Table 4.4.
- 4.78 NRA Fisheries suggest that the salmonid fishery is not performing as well as expected, possibly as a consequence of a lack of suitable spawning gravels. Channel maintenance and drainage (dredging) activities are thought to have affected habitats detrimentally for all flora and fauna including spawning gravels on many rivers. Other habitat failings are also a problem and in some cases water quality and reductions in river flow are contributory factors. Stretches of the River Coln are subject to localised intense angling pressure.
- 4.79 River habitat enhancements have been undertaken by the NRA at a variety of locations including on the rivers Coln, Cole, and the Ray (see 3.38). Further schemes are planned for the latter two rivers to ameliorate the impacts of channel maintenance and drainage activities. In addition to NRA enhancement projects, further work is planned on the River Cole as part of the River Restoration Project (see 3.37). In this case, the habitat enhancements are necessary to ameliorate some of the 6 km channel drainage improvements from Coleshill bridge to Inglesham weir in 1974 to alleviate flooding on agricultural land. This is essentially a demonstration project to show good practice in river restoration techniques. Further enhancement is also taking place on the River Leach.
- 4.80 The Community Forest Scheme (see 3.96) has ambitious plans to afforest a percentage of the floodplains of the Ray and the Cole, along with a mosaic of other habitat and land use types. The substantial river restoration of the Ray itself would be in sympathy with these plans and the initiative marks a major challenge to the NRA in seizing this opportunity and realising it, ie, land-use change in the river corridor with accompanying relaxation of standards of service in river maintenance, re-establishment of natural floodplain forest etc.
- 4.81 The generation of riparian habitat enhancements is also one of the main aims of the Upper Thames Otter Habitat Project. The Project Officer has already secured a substantial number of agreements with landowners to improve riverside cover for otters by planting scrub and the NRA intends to carry them out in the forthcoming years. The Project Officer is also advising landowners on how they can manage riparian land in a way which will benefit otters and other wildlife, such as fencing the river off from livestock to encourage better riverside cover, management of tree pollards etc.
- 4.82 There are a number of conflicts between conservation/fisheries and other uses of the water environment. Such conflicts include the impact of channel maintenance on river habitats, and recreational activities, such as jet skiing, in the Cotswold Water Park.

Table 4.4 - State of the Fishery

River	Performance of the Fishery	Comments
Ampney Brook	Poor	The river dried up in 1989, 90 and 91
River Churn	Biomass targets not achieved in 1990 in the upper reaches	Low flows in the middle and lower reaches as a result of abstraction and low precipitation have an impact on the fishery
River Cole	Biomass targets not achieved in 1992	The failure to meet the targets appears to be attributable to fish kills associated with pollution incidents
River Coln	Reaches biomass target	Level of recruitment is poor, possibly as a consequence of low flows resulting from lack of rainfall, and poor habitat. Abstraction also has some effect on low flows
River Leach	Biomass target achieved	
River Ray	Biomass target not achieved in 1991	Poor effluent quality from the Swindon STW is probably responsible for the fishery failing to meet its target. The STW has been upgraded since 1991 and the effluent quality has improved. Poor habitat also has a significant impact on the fishery
River Thames	Biomass levels are not available except for the reach from Waterhay Bridge to the Roundhouse at Lechdale.	Effluent from Swindon STW is thought to be having an impact on the fishery

Riverine environment and fisheries issues

4.83 The issues in terms of the riverine environment and fisheries relate to:

- river levels and flows;
- poor habitat as a result of drainage activities;
- effluent from Swindon STW affecting water quality, although improvements at the works should facilitate long-term improvement;
- recruitment of brown trout;
- conflict between conservation and fisheries on the one hand, and the various uses of the water environment on the other; and,
- the protection of the nature conservation resource of the Cotswold Water Park and associated rivers.

River Landscape

- 4.84 The environmental objective in relation to the river landscape, which also applies to urban and rural land use, is:
- to conserve and enhance river corridor landscapes.
- 4.85 The NRA has undertaken strategic landscape assessment of the Ampney Brook, River Churn, River Coln and the River Leach. The River Thames itself has been subject to a landscape survey but it has not been fully assessed in accordance with NRA assessment methodology.
- 4.86 In order to provide the full baseline information needed for catchment planning purposes and to provide appropriate policy recommendations for dealing with the issues affecting the landscape, further strategic and detailed landscape assessments are needed for the following rivers: River Thames, Marston Meysey Brook, Swill Brook, Derry Brook, River Key, River Ray, River Cole and Share Ditch.
- 4.87 Whilst much of the Coln and Leach catchments is of high landscape quality and warrants protection, some reaches would benefit from enhancement. With regard to the River Coln, it is notable that although the river passes through the Cotswolds AONB, the landscape quality of the river valley has been adversely affected by a degraded field pattern and urban influences in the vicinity of Andoversford. Landscape restoration is also needed at Withington and Coln Rogers. Elsewhere in the catchment the landscape quality is generally high and a strategy based on conservation is appropriate. The River Leach catchment landscape quality is also generally high but an enhancement strategy is recommended in the vicinity of Northleach and Dean Camp.
- 4.88 In the Coln and Leach catchments, further detailed landscape assessments of certain sections of the river corridor are required to determine the type of remedial work necessary and to identify areas worthy of special protection.
- 4.89 The Ampney Brook is a good example of a small limestone stream and is of great importance in the landscape in its northern reaches and is significant, in landscape terms, elsewhere in villages and their associated parks. The assessment highlighted the need for conservation of this watercourse with some restoration or management. For example, improved access or recreating a sinuous channel from north of Down Ampney to the Thames. In its northern reaches, the River Churn flows through the important Cotswold Hills landscape, and is frequently an important element in that landscape. The river has some rarity value - a good example of a limestone river, unique in its upper valley and important in its relationship with Cirencester, the Cotswold Water Park and ancient farm landscapes at North Meadow (see 3.20). The broad management strategy should be that of conservation with some restoration, ie, of river sinuosity and old watermeadows near Stratton and Siddington should be investigated. It was felt that where the Churn flows through Cirencester, enhancement should be promoted.
- 4.90 In order to pursue the objective of protecting and enhancing the river landscape the NRA must influence planning policy in the catchment. In addition, the NRA needs to become more involved in the development of agricultural policies in the catchment, such as the establishment of ESAs.

Geomorphology

- 4.91 Land use changes effect morphology and habitat of the river. The NRA will undertake geomorphological assessments in relation to specific river related projects. For example, the River Cole has been investigated

4.91 (continued)

recently in 1994 as part of the River Restoration Project (see section 4.79). In this case, the River Cole shows evidence of being heavily managed for centuries. Land-use has changed from milling and water meadows to more recent land drainage and flood protection channel works in response to urban development and agricultural intensification.

Land Use Planning and Development Pressure

4.92 Development application decisions made by local planning authorities may lead to detrimental impacts on the quality of the natural water environment. The NRA role in this process is as a statutory consultee and seeks to influence policy making at national, regional and local levels. The NRA Planning liaison and Development Control teams provide advice on individual applications both to developers and statutory planning authorities. The Authority receives around 30 planning applications each month for the catchment area around Cirencester, Swindon and the Cotswold Water Park. The NRA has set itself a target to respond to 30% of these planning applications in 14 days, 60% in 21 days and 80% in 28 days.

4.93 NRA have been working with all the relevant local planning authorities to integrate water environment issues into their statutory land use development plans. The NRA 'Guidance notes for local planning authorities on the methods of protecting the water environment through development plans' (1993) cover the whole range of water-related issues such as surface water run-off and waste water management.

4.94 It is hoped that local authorities will work with the NRA so that information and actions arising in CMPs will be integrated into their own local plans. A regional overview of NRA planning policy and planning issues is contained in the NRA document 'Thames 21 - A Planning Perspective and a Sustainable Strategy for the Thames Region' (September 1994) and has been published for consultation. This report highlights two development 'pressure points' at Swindon (housing development and water resources issues) and at the Cotswold Water Park (mineral extraction, recreation, leisure and development issues). Both have been described in some detail throughout this report.

Landscape, geomorphology and planning issues

4.95 The issues in terms of landscape, geomorphology and planning are summarised below:

- Further more detailed landscape assessments are required in the Coln and Leach to define specific landscape issues.
- The NRA needs to take a more proactive role in the planning process in order to protect and enhance river landscapes and other catchment values.
- The NRA needs to have greater input into agricultural policies shaping the catchment.
- The landscape value or a geomorphological description of many rivers in the catchment has not been undertaken or documented.
- NRA needs to have sufficient data to assess the impact of developments in the catchments especially Swindon and the Cotswold Water Park.

SECTION 5

CATCHMENT ISSUES

5. CATCHMENT ISSUES

INTRODUCTION

5.1 In the previous sections a number of issues have been identified. The order in which these issues are stated in this chapter directly reflects the proportion of views expressed in the responses to the informal consultation exercise. In this section these issues are grouped and discussed under the following inter-related headings:

- river flows and levels;
- water quality protection and enhancement;
- flooding in certain areas;
- fisheries;
- the Cotswold Water Park;
- recreation and plans to re-open canals;
- the increasing water demand and measures to meet it, eg, Severn-Thames transfer etc;
- integrated management of the entire catchment; and,
- communication.

5.2 The issues will be discussed in terms of:

(i) **Management Options:** A consideration of the strategies available to address the issue and a discussion of the implications of adopting these, followed by consideration of potential advantages and disadvantages. Detailed analyses of the possible strategies, their costs and timetables for implementation, have not been prepared and are beyond the scope of the Consultation Report.

(ii) **Implementation:** The agencies, groups and individuals who are responsible for implementing the way forward are suggested.

RIVER FLOWS AND LEVELS ISSUES

Overview

5.3 The drought of 1989-92 subsequently resulted in low flows in rivers across the area. This caused much concern both within the NRA and amongst the general public.

Issue

5.4 During the drought of 1989-92, there was considerable public concern about flows, levels, water quality and in-stream ecology in the groundwater-fed watercourses in the northern part of the catchment.

5.4 (continued)

The public attributed the flow reductions to groundwater abstractions. The NRA commissioned a study to look at the causes of flow reductions and changes to the aquatic ecosystem in the River Coln. The main findings of the study, published in 1992, are as follows:

- (i) severe one-year droughts and, in particular, low winter rainfalls (eg 1976) are considered to have a greater detrimental impact on river flows than more extended periods of less severe drought 1989-92. Severe droughts can cause part of the Great Oolite aquifer to dewater fully - this can result in the central section of the river drying in the late summer, as in 1890 and 1976;
- (ii) groundwater abstraction appears to be a minor factor in reducing river flows compared with the impact of the 1989-92 drought;
- (iii) smaller flows have resulted in a reduction in aquatic plant growth. These plants are normally so abundant that they hold back river flows and cause river levels to rise. The reduction in channel vegetation and the consequent decrease in levels has had a severe impact on both the appearance and the ecology of the river;
- (iv) a change in plant species composition seems to have occurred, with water crowfoot being replaced by emergent and encroaching weed in some reaches. The reasons for the change are not clear, but may be related to river flows;
- (v) siltation of the river bed, which was a key concern amongst anglers, is probably a consequence of reduced river flows rather than increased silt loadings;
- (vi) river and land management do not appear to have contributed significantly to the observed problems. However, dredging in the 1950s may still be having an impact on the aquatic ecosystem in some reaches.

- 5.5 The hydrogeology of the Cotswolds is complicated but further geological field studies to advance our understanding may not be cost-effective.

Management Options

- 5.6 The report on the Coln presented a number of recommendations. These and other suggestions are presented below as possible ways forward.

(i) **Monitor the changes in aquatic plants and undertake research**

The change in aquatic plants from species such as water crowfoot to attached algae has been reported by river users in many catchments in the Thames region. Research into this problem could be undertaken and a monitoring programme established to provide baseline data. If research is undertaken it should be targeted to rivers or reaches where changes in vegetation characteristics do not conform to the expected.

Advantages:

Increased understanding. This understanding will assist in the accurate identification and assessment of the problem.

Disadvantages:

Cost of monitoring and research. No guarantee of conclusive results.

5.6 (continued)

(ii) Set prescribed flows

Prescribed flows provide a useful management tool and have already been set on the Coln and Churn to manage abstractions. Setting prescribed flows requires an understanding of the ecological requirements of the individual streams in the catchment.

Advantages: Enable targets to be set. Allows performance to be assessed.

Disadvantages: Determination of ecological requirements is complex. The NRA is currently engaged in research aimed at establishing requirements for ecologically acceptable flows, since it is not possible at present to scientifically specify the amount of flow required to sustain the river environment. Fully developed techniques are unlikely to be available for several years. Cost is also a disadvantage.

(iii) Undertake catchment-specific studies in the other Cotswold catchments

In most cases the cause of low flows is clearly understood, eg, the low rainfall during the drought of 1989-92. Where there is evidence that other factors may have a significant effect, the NRA may undertake studies aimed at assessing the extent of the problem and causes.

Advantages: If the causes of the low flows can be clearly identified and, where justifiable, action plans can be formulated.

Disadvantages: Cost.

Implementation

- 5.7 The NRA has a lead role to play in all the above options. In terms of the first option English Nature may wish to become involved in a large scale study into aquatic plants, particularly if valuable freshwater sites were experiencing adverse changes, and where these were apparently not the result of natural changes in flow regimes. TWUL may wish to participate in further studies into the aquifer system in the catchment.

MEYSEY HAMPTON GREAT OOLITE ABSTRACTION LICENCE ISSUE**Overview**

- 5.8 Groundwater abstraction needs to be managed to keep the impact on river flow within acceptable bounds.

Issue

- 5.9 The current (TWUL) abstraction licence for the Meysey Hampton Great Oolite source expires in January 1998. NRA will then review the location and quantity of abstraction from this aquifer. In addition to Meysey Hampton (GO) itself, the effects of abstractions at Latton and Baunton should also be assessed.

Management Options

5.10 The following options for investigation are suggested:

(i) Desk Study

Consider all existing data on groundwater levels and river flows in relation to abstraction history.

Advantages: Cost-effective review of existing data.

Disadvantages: Conclusions may be limited and there will be no evaluation of new information.

(ii) Field Investigations and Pumping Trials (in conjunction with TWUL)

In addition to (i) above, assess the need for, and carry out pumping trials and other field investigations. These will need to utilise existing facilities as it is likely to be difficult to justify substantial capital expenditure.

Advantages: Collection and evaluation of new field data.

Disadvantages: Additional costs incurred over and above option (i). Likely to be an expensive option. May be difficult to arrange with a sufficient degree of control.

(iii) Mathematical Modelling

In addition to (i) above, carry out modelling of the groundwater systems of the Oolite limestone aquifers. An existing model is restricted to the Great Oolite aquifer, whereas a multi-layered model incorporating the Inferior Oolite aquifer and intervening clays may be required for more accurate and representative simulations. An equivalent model has recently been developed for the adjacent Malmesbury Avon catchment in NRA South Western Region.

Advantages: Likely to provide the most comprehensive analysis of all options available.

Disadvantages: May be less certain than field trials. Similar order of cost as option (ii).

Implementation

5.11 Any investigations should be completed by Spring 1997 to allow time to formulate and consult on a plan for groundwater abstraction management well in advance of expiry of the Meysey Hampton licence. Any field pumping trials will require full liaison with and the co-operation of TWUL and along with any other investigations should be carried out during 1995/96.

WATER QUALITY PROTECTION AND ENHANCEMENT ISSUE

Overview

- 5.12 The river quality objectives (RQOs) for several reaches require further work before they are confirmed. Biological monitoring indicates pollution in the Rivers Key and Ray and in many of the smaller brooks in the southern part of the catchment. A NVZ is in the process of being established at Fairford to protect the water quality of a groundwater abstraction used for potable supply.

Issue

- 5.13 Several reaches require capital investment at STWs to allow the quality to achieve or be maintained at their RQOs. Several reaches, also require further research on their water quality before the RQOs can be confirmed (see table 4.1).
- 5.14 Biological monitoring indicates poor water quality in sections of the rivers Key and Ray, and in the Swill, Liden, Bydemill and Veneymore Brooks. In the River Key and the smaller brooks the sources of pollution may be from agricultural activities or discharges from rural sewerage schemes. The reason for poor biology in the River Ray is intermittent pollution from urban sources and possibly run-off from contaminated land.
- 5.15 There are no Nitrate Sensitive Areas in the Upper Thames catchment. However, a NVZ has been proposed at Fairford under the EC Nitrate Directive. This zone will assist in the protection of groundwater quality at the TWUL abstraction at Fairford. In addition, the NRA is commencing a groundwater quality monitoring programme which will provide baseline information.
- 5.16 A Sensitive Area (eutrophic) has been designated on the River Ray downstream of Swindon, as far as its confluence with the River Thames, under the Urban Wastewater Treatment Directive. The NRA considers that the use of phosphorus removal should be considered once the water quality of the Ray (post-STW improvements) stabilises and the effect on river flora assessed.
- 5.17 During the mid 1980s, as part of a routine fisheries survey by the then Thames Water Authority, a sample of River Ray fish tissue was chemically analyzed. It was found to contain what appeared to be high levels of pesticide compounds including dieldrin. The angling community, most notably the Upper Thames Fisheries Consultative, wish the NRA to pursue this by carrying out further investigation such as a full ecotoxicological survey of the River Ray to ascertain the veracity of these results.

Management Options

- 5.18 The following options for each of the issues identified above are suggested:

(i) Further water quality assessment and revision of RQOs

Major capital investment is planned by TWUL for improvements to STWs. The NRA is guiding TWUL on the prioritisation of these improvements and has indicated the need for investment on several STWs in this catchment. Where further investigation is warranted, computer modelling will be used to predict the possible future effects of discharges on the reaches indicated in table 4.1. This will enable the NRA to set RQOs that will reflect possible changes due to alterations in the quality of discharges within consent limits.

5.18 (continued)

Advantages: Overall improvement in water quality, eg, because of TWUL investment. A better understanding of the chemical variation of the watercourses will be reached and the RQOs will be set more appropriately.

Disadvantages: Costs (to TWUL) and difficulty of achieving 'accurate' computer modelling.

(ii) Continue a proactive approach to pollution prevention and control

To further water quality protection, undertake research into the causes of failures to meet biological 'targets' and causes of chemical water quality achievement being lower than expected. The research programme will need to focus on the following areas:

- impacts of small scale rural sewage disposal on water quality. Many villages in the Upper Thames area have no foul sewer available and therefore rely on cesspools, septic tanks or private sewage treatment plants for disposal. In many cases they give rise to localised pollution problems which are difficult to resolve. The NRA needs to be able to collect more information to quantify this problem; for example, the NRA are supporting a student project on rural sewage disposal in the Cotswold DC area as a first step to understanding the problem generated by a lack of sewerage in the Upper Thames area. This will include a survey by questionnaire accompanied by NRA leaflets on domestic pollution prevention and may serve to raise public awareness on the issue. Subject to post-project evaluation, the NRA may repeat the exercise in other areas of the Upper Thames catchment;
- means to control pollution incidents from urban and agricultural sources;
- the surface water quality problems associated with urban run-off and contaminated land, particularly in the Swindon area. Special investigations could also be considered to ascertain the extent of these problems, ie, ecotoxicology. In the short term, monitoring of the local watercourses needs to be undertaken. However, in the long term an investigation of the extent of contamination would be beneficial. Pollution prevention campaigns have been carried out around Swindon and will be repeated in the future with the aim of minimising contamination of surface water.

Advantages: Minimise pollution incidents. The result of the research will enable decision-makers to identify failures to meet targets.

Disadvantages: Cost of monitoring, implementation and research. Investigations of this nature will probably take a few years to complete due to current operational priorities.

(iii) Protection of Groundwater Quality

There are three elements to this option; (a) implementation of the NRA Groundwater Protection Policy with the designation of groundwater 'vulnerability' and the establishment of groundwater protection zones; (b) establishment of a monitoring programme; (c) establishment and management of NVZs and other protection/remediation measures as necessary.

Advantages: Monitoring will provide valuable information to 'water managers'. The establishment of NVZs will assist in protecting groundwater

(iii) (continued)

quality and will result in overall savings to the public in relation to the treatment of water. Proactive use of the policy will give guidance to developers and protection of groundwater quality.

Disadvantages: Costs of monitoring and costs associated with establishing NVZs.

(iv) **Continued Biological Monitoring and Monitoring of Discharges**

The routine monitoring of macroinvertebrates (sites surveyed at least annually), bacteriological sampling (rolling programme), algal sampling (specific sites) and aquatic plant sampling (rolling programme) is to be continued. Continued biological monitoring upstream and downstream of outfalls from STWs, fish farms and other discharges is also advocated as well as specific investigations into consents under review and at specific potential pollution hotspots such as contaminated sites in the Swindon area.

Advantages: Monitoring will provide information on the biological status of watercourses in the catchment, as well as assessing the impact of various discharges to watercourses. This information is essential for effective water quality management.

Disadvantages: Costs of monitoring, consent reviews and costs to dischargers.

Implementation

- 5.19 The NRA has a role to play in all the above options. TWUL may wish to become involved in options (i) and (iv). Farmers, MAFF, local authorities and industry all have roles to play in options (iii) and (iv).

FLOODING ISSUES

Overview

- 5.20 As stated previously, flooding occurs in three or four areas in the catchment. The NRA operates two different flood management policies and the implementation of both of these is associated with a number of problems.

Issue

- 5.21 The towns affected by localised flooding problems include Ashton Keynes, Somerford Keynes and South Cerney. In the case of Somerford Keynes, future proposals for any permanent flood alleviation works must be linked with the development of the Lakewoods site detailed planning permission south of the village. In the majority of cases the flooding is associated with minor watercourses where the NRA does not have statutory responsibility for flood risk management or control. (The NRA has responsibility for flood risk management on designated 'main' rivers only). Both the NRA and local authorities have permissive powers to act so as to alleviate any problems. However, the NRA does become involved in these local issues as it is viewed by the public as the agency responsible for river and flood management. In these cases the normal approach of the NRA is to set up communication links with the relevant local authority, which has statutory responsibility for flood risk management, and the affected community.

- 5.22 On designated main rivers the NRA operates two parallel flood management policies; (i) the Non-Tidal Floodplain Policy, and (ii) a system of Standards of Service for different types of land use as stated in section 4.66.
- 5.23 The Non-Tidal Floodplain Policy seeks to limit development in areas which flood more frequently than once in one hundred years. However, at present, it is not possible to determine the potential 100-year flood accurately. NRA-TR in particular depends heavily on historical data such as the 1947 flood (which has been used as a surrogate 1 in 100 year return period event). Therefore, the NRA needs to produce 'synthetic flood maps' whereby the flood envelope is defined statistically from computer models.
- 5.24 Building up flood risk data is a huge and costly undertaking. Therefore, the NRA has decided to prioritise its catchments for work and the Upper Thames and sections of its tributaries are considered to be in the priority 1 category.
- 5.25 Implementing the Standards of Service policy is problematic. Flooding on some land use types may exceed the required target but the costs of raising flood protection to the required standard may significantly outweigh the benefits. In effect the policy appears to assume that the current land use in an area is acceptable whereas in some circumstances it may be more appropriate to encourage land use changes rather than set impossibly high standards of service. This is a matter for MAFF and the DoE to consider in conjunction with the NRA.
- 5.26 Implementing the SoS policy requires a substantial amount of data. The acceptable standards and current frequency of flooding for each reach on a river need 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 permit, and updating targets as necessary.
- 5.27 Another problem with the Standards of Service approach is that it is implemented on a reach, by, reach basis which makes the policy difficult to integrate into a total catchment perspective. Equally, land-use may change over time necessitating a change in the standard of service. For example, a flood scheme may be designed to provide a low level of protection but subsequent development may require a higher level of service, or high value agricultural land may be placed under set-aside which will reduce the level of service required and will result in a loss of investment in flood protection works. The Standards of Service concept, therefore, is not straight forward to apply.

Management Options

- 5.28 Options for each of the three issues identified are as follows:

(i) **Localised Flooding**

A study of the local flooding problems at Somerford Keynes is being carried out by the NRA following some emergency work undertaken during the 1993/94 winter to provide an alternative route for flood water. In terms of flooding which does not occur on 'designated main rivers', ie, flooding for which local authorities have permissive powers to act, the NRA may wish to continue to act as a broker between the affected community and the local authority. There is also a public perception problem over the differing responsibilities of the NRA and local authorities which needs to be addressed, eg, through publishing public relations material, taking opportunities to address meetings etc. (See also Cotswold Water Park issue 5.36)

5.28 (continued)

Advantages: NRA can disseminate its extensive experience in flood risk management to both the affected community and the local authority. Better flood risk management could result.

Disadvantages: The NRA has no statutory involvement in localised flooding (although it has a duty over the general supervision of drainage matters) and would probably have to be invited to participate in the management process. Cost of 'educating' external parties.

(ii) Non Tidal Floodplain Policy and determination of the once in 100 year floodplain

Before hydraulic modelling can be undertaken a considerable amount of data has to be collected, eg, aerial photography and photogrammetry to provide survey data. Therefore, data collection is the first part of the S105 exercise to be executed. Additional aerial photographs will be taken during winter 1994/95. The Memorandum of Understanding (March 1994) also requires that local authorities should provide the NRA with data which it requires to enable it to undertake this initiative.

The NRA also needs to ascertain the level of detail required within these flood risk investigations, ie, in light of the expense would a broad-brush approach be adequate in some cases? Computer model development will also need to be undertaken.

Advantages: Better information for decision making and fulfil the requirements of DoE circular 30/92 towards more protection from flooding.

Disadvantages: Cost of the study is large and it will require a substantial investment of staff resources.

(iii) Standards of Service Approach

Conduct a research programme into the application of the SoS approach, perhaps using a range of different catchments as case-studies. Flood defence staff will continue to use their (subjective) judgement based on experience. After extensive research, the SoS approach may, in time, be used as resources and funding permits.

Advantages: The results of the research programme will allow river managers to apply the SoS concept in a more effective and objective manner and compliment the views of experienced staff when making decisions.

Disadvantages: The research may take several years to complete, therefore the SoS approach may not be applied effectively for a number of years. Research may be better applied to other catchments outside the Upper Thames CMP area. The cost of research would be huge, although the long term benefits of having an effective flood risk management system in place may well exceed this cost.

Implementation

5.29 The NRA has a lead role to play in all the above options. Local authorities and communities have a role to play in option (i).

FISHERIES ISSUES

Overview

- 5.30 Throughout much of the catchment the fishery does not appear to be performing as well as could be expected. In addition, there is conflict between fisheries and other users in the catchment.

Issue

- 5.31 The biomass targets on the Rivers Churn, Cole, Ray, Thames and the Ampney Book are not being universally achieved. The river ecosystems appear to be capable of supporting a good quality fishery and the reasons for the lower than expected performance of the fisheries are uncertain but are probably a combination of low flows, habitat degradation and poor water quality. Other possible reasons include the impact of the drought in the early 1990s and poor recruitment which may be related to a lack of spawning gravels.
- 5.32 There are conflicts between fisheries and other uses. For example, in the Cotswold Water Park some recreational uses such as jet skiing, are in direct conflict with fisheries use, as well as wider nature conservation interests.

Management Options

- 5.33 The following ways forward are suggested:

(i) Continue to monitor the state of the fishery

Baseline information, including fish habitat assessment, is required to determine the state of the fishery and to detect changes. Currently the NRA undertake surveys approximately every five years and it is suggested that this programme continues.

Advantages: Better information. Results of fishery enhancement efforts can be assessed and monitored.

Disadvantages: Cost of monitoring.

(ii) Investigate the cause of the small amount of suitable spawning gravels

One possible explanation for the lack of suitable gravel has been its removal from the river by past dredging operation. Further investigations are required.

Advantages: Better information allowing an accurate assessment of the problem. Information obtained may be incorporated into other management activities which may have an impact on spawning gravels, such as channel maintenance for flood management purposes.

Disadvantages: Cost of investigations.

(iii) Reduce the impact and frequency of pollution incidents

In the River Cole catchment, polluting spillages appear to be having an impact on the fishery. The NRA will seek to ensure that pollution incidents are kept to a minimum through pollution prevention and consent enforcement activities. The issue of pollution incidents is discussed further in Section 4.36.

(iii) (continued)

There is the possibility that such lower than expected biological results may not be due to pollution incidents but to another water quality problems and this should be investigated to ascertain if discrepancies exist between biological and overall water quality results.

Advantages: Improvement in the fishery.

Disadvantages: Cost.

(iv) Prepare a Fisheries Plan

A fisheries plan should be prepared for the catchment.

Advantages: The development and improvement of the fishery would be planned in a sustainable manner. The plan could be used to resolve conflicts between fisheries and other users. A fisheries plan could form part of an overall strategy for the Cotswold Water Park. Long-term costs associated with fisheries management could be reduced.

Disadvantages: Upfront costs of preparing the plan.

Implementation

5.34 The NRA has a key role to play in monitoring and improving the state of the fishery and in conducting research into fish habitat in the catchment. Anglers may also have a role to play. Involving anglers in both a monitoring programme and fish habitat studies may be beneficial in optimising the fishery and from a communications perspective.

5.35 In terms of reducing the risk associated with pollution incidents the NRA has a key role to play. Other agencies and individuals also have an important role, including farmers, industrial operators, transport operators and TWUL.

COTSWOLD WATER PARK ISSUE

Overview

5.36 Aggregate extraction in the Cotswold Water Park gives rise to a number of issues including impacts on fisheries, flooding and nature conservation. There is also pressure for housing and holiday home development.

Issue

5.37 The Cotswold Water Park is a nationally important water feature, especially in terms of wildlife. From a catchment perspective, the Park is important in terms of the fishery, flood hazard management, recreation and conservation. The Cotswold Water Park SSSI is formed from 11 of the Park's existing lakes. The Park has been created by aggregate extraction and the extraction needs to be carefully managed to ensure that current uses are sustained and that opportunities, rather than problems, are created. The sustainability of the quality and quantity of surface and groundwaters, particularly, require

5.37 (continued)

the strict control of gravel extraction. De-watering can have significant effects on flows in watercourses with resultant reduction in water quality due to lack of dilution of effluents. In complex areas such as the Park, de-watering of one pit can enhance flows in one water body at the expense of another. It is essential that both the owners and users of the park are in agreement. The following specific issues need to be addressed:

- (i) effects of gravel workings on flows in the rivers Thames, Churn and Swill Brook;
- (ii) the development of several major schemes in the western sector of the park without main drainage and increased pressure resulting from improvements to the A417/419;
- (iii) the incidence of flooding through run-off from the lakes in the western sector;
- (iv) the future of extraction of gravel in the Down Ampney area;
- (v) problems connected with the now approved Latton Bypass;
- (vi) uncertainty in the eastern sector of how the park will develop because of the problems with the bypass for Lechlade and the absence of an improved spine road in this sector (although improvements to this road are programmed for implementation);
- (vii) sustainability of water quality in the lakes themselves with increasing and changed usage eg pollution risk, eutrophication etc.

5.38 The park is currently managed by the Cotswold Water Park Joint Committee which is made up of representatives from the constituent local authorities. To enhance the capability of this management, the local authorities have approved in principal the formation of a charitable trust which aims to:

- (i) undertake the practical management of the land held by the joint committee to fulfil recreational or access objectives;
- (ii) undertake such other countryside or recreational management tasks as delegated by the constituent local authorities eg rights of way maintenance;
- (iii) undertake other works for private individuals, other bodies and charitable organisations (eg English Nature, RSPB, mineral companies, parish councils) as conform to the objectives of the trust, and
- (iv) build on the core and task funding from local government by attracting grants, private sector contributions and commercial income.

The role of the joint committee and organisation of the Trust have yet to be finalised. However, it is hoped that the Trust will have the resources necessary to successfully collaborate with the NRA and others in the promotion of research and the other initiatives identified in the 'Management Options' given below.

Management Options

5.39 Three possible options have been identified:

(i) **A Land use Strategy - The Upper Thames Land Use Initiative**

The Upper Thames Land Use Initiative has been developed by the NRA as a vision for the Cotswold Water Park which seeks to ensure that future development is environmentally sustainable, and in particular takes account of the environmental sensitivity of the area. It was based on a site-by-site analysis of the areas of search for minerals. It has been agreed by the NRA and has also been accepted by MAFF and English Nature as a sound basis for the future planning of the area. It comprises the three following elements (see Figure 25):

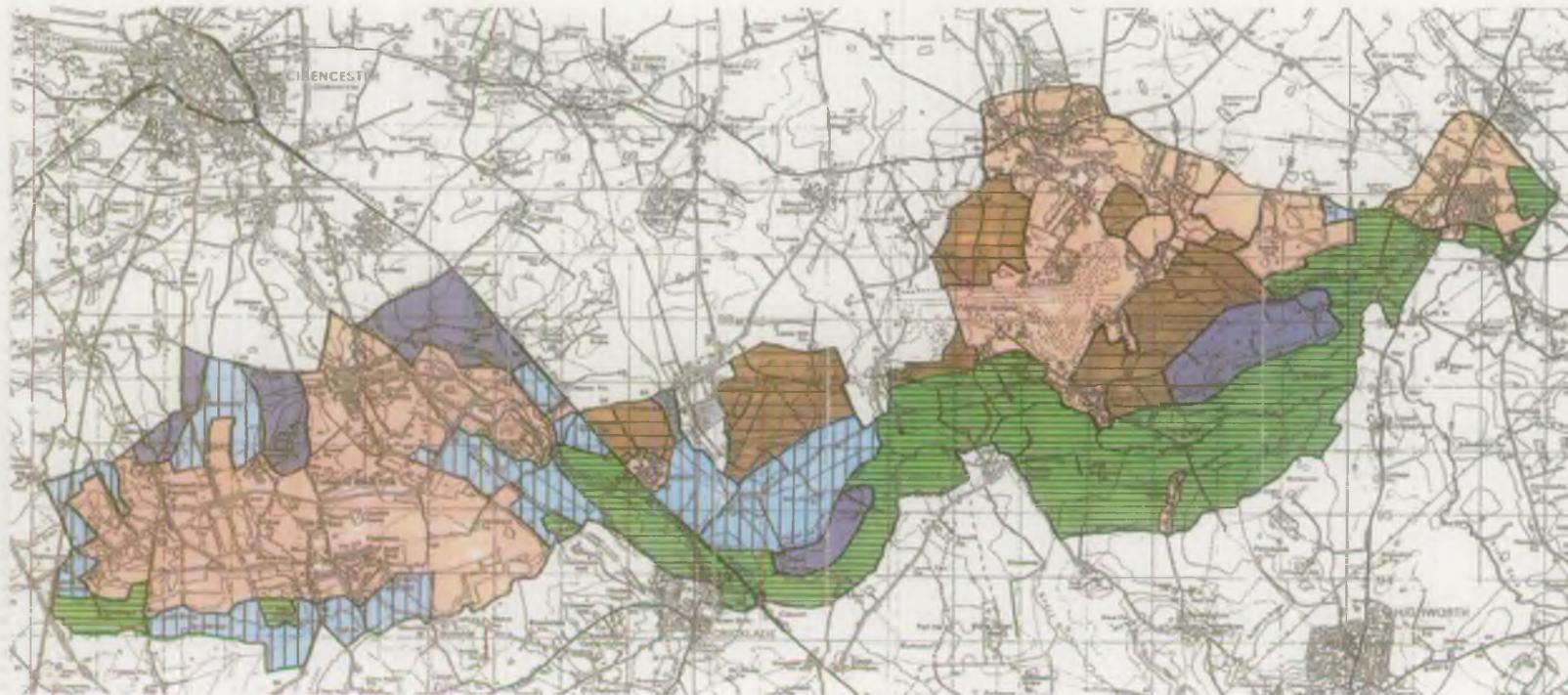


Figure 25

Upper Thames CMP: Cotswold Water Park (Upper Thames Land Use Initiative)

-  Areas where the NRA Thames Region is likely to object to mineral extraction.
-  Areas where mineral extraction followed by restoration to agriculture is acceptable.
-  Areas where mineral extraction followed by restoration to diverse wildlife habitats including open water and wetland for nature conservation purposes is preferred.
-  Existing settlements and worked land.
-  Non sand and gravel bearing areas.



5.39 (continued)

- (a) Areas where the NRA is likely to object formally to extraction through the planning process, such as SSSIs;
- (b) Areas where extraction followed by restoration to agriculture is acceptable;
- (c) Areas where extraction followed by restoration to diverse wildlife habitats, including open water and wetlands, is acceptable.

The NRA intends to promote the strategy through the planning process and will advocate certain development options at the appropriate planning fora.

Advantages:

The advantages of this strategy include the potential enhancement and sustainability of the aquatic environment in the Water Park. This proactive approach allows the NRA in its role as a statutory consultee to make a material contribution to the debate on the future of this important environmental resource.

Disadvantages:

The document is an overview and as such cannot be used as a practical management tool. Therefore as another possible management option the existing initiative could be made more detailed and specific and ultimately more 'useful'. Also flood routing during high level flood events may not be the same as 'traditional' flood flows.

(ii) Further studies

Research is required to ensure that mineral extraction in the Cotswolds is environmentally sustainable. The NRA believe that the site is so important that, ideally, it requires a detailed management plan to be devised after a series of specific site investigations - the following in particular:

- (a) *The hydrology, hydrogeology and hydraulics of the Cotswold system need investigating.* The purpose of this investigation will be to assess the impacts of mineral extraction on flooding, water quality, river flows and water dependent habitats;
- (b) *Landscape assessment.* The impact of future developments on the overall landscape needs to be assessed, particularly in relation to the Thames Path National Trail. Other bodies, such as the County and District Councils and the Countryside Commission, may wish to be involved;
- (c) *Buffer zones.* Buffer zones are beneficial from a number of environmental perspectives, including water quality protection and ecological enhancement. However, guidelines for their implementation are still at a provisional stage. Further information is required on the type and location of buffer zones which would be of greater benefit in the Water Park Area.

Advantages:

The main benefit from the above studies will be better information for decision making. Identifying and carrying out studies will mean that a full NRA view is promoted at the pre-application stage.

Disadvantages:

Cost. However, this may be overcome if developers are financially responsible for further studies.

5.39 (continued)

(iii) Actions to reduce flood-risk to people and property

In the absence of detailed research, certain actions can be taken to reduce flood risk. This approach is in keeping with the concept of precautionary action. Additionally, extraction could be undertaken in relation to groundwater contours to reduce flooding. Consideration should also be given to after use - care is required in deciding how the land is to be utilised with particular regard to raising ground levels, bunding, etc.

Advantages: Reduction in flood risk.

Disadvantages: Cost to others.

Implementation

5.40 The NRA has a role to play in all the above options. For some options a range of organisations will be involved, for example local authorities and English Nature. All the relevant agencies in particular the Cotswold Water Park Trust will need to communicate and co-ordinate their activities to ensure the sustainable management of the region. The NRA needs to be proactive, it must have clear and defined options for the Cotswold Water Park, particularly in view of the fact that there are so many other interested parties.

RECREATION AND CANAL RESTORATION ISSUE**Overview**

5.41 There are a number of recreational issues in the catchment:

- community interest groups support the reopening of the two canals in the catchment, the Thames & Severn canal and the Wilts & Berks canals. However, there is concern that there may be insufficient water to operate the canals;
- the River Thames Recreation Strategy is currently being developed;
- certain user groups, in particular canoeists, feel under-represented in terms of recreational facilities in the catchment.

Issues

5.42 In terms of public opinion, the re-opening of canals is welcomed. Certain community-based groups, in particular the Cotswold Canals Trust (CCT), are actively promoting the reopening of the Thames & Severn canal. In addition there are proposals to re-open the Wilts & Berks canal. The re-opening of canals represents the development of a valuable recreational resource but has a number of multifunctional implications.

5.43 Canals require an appreciable quantity of water to support navigation and run successfully. As has been discussed in Section 3.66 earlier, there are already significant water resource constraints in the catchment and the re-opening of the canals may intensify water resource problems. The CCT have suggested incorporating the Thames & Severn canal into Wiltshire CC's Minerals plan and using de-watering water

5.43 (continued)

from gravel extraction to supply the canal or using the canal as the medium for strategic water transfer. They also believe that the canal could be used to relieve flooding and that available water could be back pumped to maintain water level and flow. The NRA is no longer pursuing the use of the canal as part of a transfer option.

5.44 The specification for a 'canal corridor study' is currently being put together by Gloucestershire CC. It is likely that the study will be project managed by British Waterways (in collaboration with the relevant local authorities) and aims to investigate the social and development elements of the canal's potential restoration and operation and encourage the public debate of these issues. It will include the entire length of the Thames & Severn Canal and will seek to identify sensitive areas which warrant further investigation. Funding has yet to be resolved. The NRA will be consultees in the project if instigated. The promoters hope to begin the project early in 1995 and envisage a four month investigatory period. This study was originally suggested by CCT who believe the project will compliment existing engineering feasibility studies towards a holistic assessment of the proposal.

5.45 The Wilts & Berks Canal Amenity Group promotes the 'protection, preservation and improvement of the Wilts & Berks Canal and its branches for the benefit of the public, with the ultimate goal of restoring a continuous navigable waterway linking the Kennet & Avon Canal, the Thames & Severn Canal and the River Thames'. Restoration has been continuing steadily especially around Swindon. For example, the group are poised to begin work at Wootton Bassett in the autumn after the completion of an ecological study partly funded by Wiltshire Rural Action. This particular section is set to integrate with part of the Great Western Community Forest. The group have realised that a full-scale engineering feasibility study, encompassing the costs and benefits of the restoration, needs to be considered seriously to secure progress in the future.

5.46 The British Canoe Union has pointed out that there are too few canoe facilities in the Upper Thames catchment. NRA staff with responsibility for recreation concur with this view. There may be the possibility that other user groups are similarly under-represented in terms of recreational facilities.

Management Options

5.47 The following strategies are suggested:

(i) **Conduct a thorough investigation into the environmental aspects of re-opening the Thames & Severn canal and the Wilts & Berks canal**

To ensure that canal restoration has negligible impact on the environment, an environmental impact assessment (EIA) should be undertaken by the developers. This assessment should pay specific attention to the water resource-related aspects of the canals.

Advantages:

The environmental issues can be identified. The water resource constraints can be objectively assessed.

Disadvantages:

Cost - An EIA will probably have to be undertaken as part of a scheme to re-open the canal.

(ii) **Develop recreation facilities for specific activities**

Where it is clear that recreational facilities are lacking for certain uses, the NRA may be prepared to

(ii) (continued)

provide these facilities, ie improved access, bridges or park benches etc at the Liden lagoon or encourage the user group if they seek to provide the facilities themselves. However, the provision of additional recreational facilities should not be conducted on an ad hoc basis but should be viewed from a total catchment perspective within the context of the Recreation Strategy (for the River Thames itself). The term 'facilities' is very wide ranging and may include foot paths such as the Thames path and associated car parks, refreshments or camp sites.

Advantages: Facilities will be provided for user groups who need them.

Disadvantages: Cost of providing facilities; potential conflict between uses.

(iii) **Development and implementation of a River Thames Recreation Strategy (non-tidal Thames)**

The Recreation Strategy consultation document proposes a series of policy statements and recommendations for action. Those pertinent to the Upper Thames include the following:

- (a) *Policy 1:* The banks of the Upper Thames are a valuable countryside resource and should be protected from development which will affect the rural and tranquil nature of the area. The enjoyment of the area for recreation should be encouraged, with visitors managed so that the underlying rural landscape is not disturbed.
- (b) *Policy 2:* Priority will be given to the improvement of the amenity value of the riverside in areas where there is potential and it is appropriate to do so. The source of the Thames is an important site, both as a local feature and because it marks the beginning of the Thames Path. The provision of important visitor facilities, including information, close to the site should be encouraged.
- (c) *Policy 3:* In the Upper Thames the development of additional permanent moorings on the main river channel should be resisted in order to maintain the 'empty', rural character of the river valley. It is believed that there is scope for additional off-stream moorings, but these must be low key and sensitively located in areas where there is existing development.

If these policies are accepted, then the NRA and others will be charged to implement them and promote them.

Advantages: A recreation strategy will enable balanced development to occur. One of the strategy's key functions will be the co-ordination of the numerous organisations who are involved with the 'management' of the River Thames.

Disadvantages: Cost of developing the policy and managing possible conflicts of interest.

Implementation

5.48 The NRA has a key role in many of the above options and strategies. In terms of promoting the canal development a number of different agencies have an involvement, including local authorities and the relevant canal promotion groups. User groups, such as canoeists, have a key role to play in working with the NRA to provide facilities. In the latter case, the provision of facilities is out of the NRA's control and in these cases the NRA will seek to influence others, eg, local authorities through the planning process.

FUTURE WATER RESOURCES: MEETING FUTURE DEMANDS FOR WATER ISSUE**Overview**

- 5.49 'Future Water Resources in the Thames Region - A Strategy for Sustainable Management' (1994), published by the NRA, shows that the demand for water from current planned development in the area can be met from existing licensed resources. This includes the major expansion of Swindon, of which the Northern Sector Development is a key component. The demand arising from this development will be met by increasing the conjunctive use of existing licensed local and strategic resources.

Issue

- 5.50 Meeting future needs for water resources will require a combination of methods to manage growth in demand which will involve us all in one way or another. For example, through further leakage control, possibly domestic metering and generally raising awareness of more efficient use of water at work and in the home.
- 5.51 If growth in demand cannot be managed in the longer term, new strategic schemes may need to be promoted. A number of potential schemes have been identified, including a new reservoir in south-west Oxfordshire, possible inter-basin transfers in the region and increasing re-use of water.

Management Options

- 5.52 The NRA-TR recognises that there are many uncertainties in planning for the future and in forecasting demand as well as the time needed to promote major new water resource schemes and to address all the potential environmental impacts. The region has initiated investigations to establish a position on each of the key water resource development options and is committed to completing these over the next five years. During this time a much clearer picture should become available of the scope for managing growth in demand for water and promoting water use efficiently. The following two management options should be considered in light of this:

(i) Managing Growth in Demand

The sustainable management of the region's water resources relies on the proper and efficient use of water. Essential to this is the achievement of economic and practical levels of leakage control. Domestic metering may also have a significant part to play in this. The NRA believes that both OFWAT and the Water Companies should be given a statutory duty to promote the efficient use of water.

Advantages:

Managing the growth in demand for water may delay the need for new water resource schemes or potentially avoid their development for the foreseeable future. Many new schemes will be remote from the immediate area of need and also have significant environmental impact.

Disadvantages:

None to the NRA.

(ii) NRA Planning Guidance To Local Authorities

In liaison with the local planning authorities, the NRA would normally seek to discourage development (unless new resources can be made available in good time) in locations where:

(ii) (continued)

- water resources are already scarce; or,
- additional development is likely to result in less reliable supplies for the existing population and industry.

Without adequate co-operation between the planning authorities, the NRA and the Water Companies to identify and avoid such development, the NRA must be concerned that it may result in pressures for further abstraction with undesirable environmental consequences. Such co-operation may be achieved through regular fora, organised by the local authorities, between all the interested parties to discuss areas of interest.

Advantages: Forward planning will provide guidance to local authorities ensuring that infrastructure constraints are fully recognised and that the timing of development does not compromise existing levels of service.

Disadvantages: None.

Implementation

- 5.53 The NRA, Water Companies, the Water Industry Regulator (OFWAT), water consumers, planning agencies and central government all have a role to play in the implementation of the above options.

INTEGRATED MANAGEMENT ISSUE

Overview

- 5.54 Sustainable management, which is the overall concept guiding the development of this catchment plan, requires a holistic integrated approach.

Issue

- 5.55 As a key part of the move towards sustainable human use of ecosystems, a more integrated approach to natural resource management is required. Developing integrated management approaches represents a substantial challenge to all those who live in and use a catchment. The concept of integration requires specialists to broaden their perspective and appreciate the impact of specific activities on the entire catchment and over different periods of time.

Management Options

- 5.56 Three ways forward have been identified:

(i) **Develop a research programme into integrated management using specific catchments or sites**
 Research and investigation into the practical aspects of integrated management is required. Catchments should be identified as case studies to explore the problems and practicalities of implementing the concept of integrated catchment management. The Upper Thames catchment lends itself well to such a programme on account of the large number of sub-catchments, one or two of which could be chosen for such a project, eg the Cole and Ray. The latter are good candidates in view of the Community Forest scheme, its potential for land-use change and habitat creation, and the associated ramifications for the NRA. ESAs and Water Level Management Plans are other collaborative opportunities.

(i) (continued)

Opportunities for community-based initiatives should also be identified whereby the NRA takes a collaborative, but not necessarily leading, role on certain projects. In this instance it would be particularly useful to monitor the success of different parties working together.

Advantages:

The techniques of integrated catchment management can be developed in a structured environment. The results and achievements can be disseminated to natural resource managers throughout England and Wales.

Long-term catchment management costs, such as flood defence and channel works, may be significantly reduced.

Disadvantages:

High initial investment in research and lack of staff resources.

(ii) **Greater involvement by the NRA in planning and development issues**

It is better to influence development proposals at an early stage rather than have to react to decisions when they are made. There is a role for the NRA to promote the protection and enhancement of the water environment at the earliest possible stage in planning and development issues. A proactive rather than a reactive approach should be adopted, eg, through 'area-specific' planning studies.

Advantages:

A higher proportion of planning and development issues will take account of impacts on the water environment.

Disadvantages:

Additional costs to the NRA of becoming involved in planning/development issues. Considerable effort will be needed to get this established.

(iii) **Long-term monitoring and targeted data collection**

Continued long-term monitoring is necessary to ensure that changes over time and trends are detected. Data deficiencies and the need for additional investigation have been highlighted throughout this report. This should include the success of the Catchment Management Plan itself, eg, actions achieved, bodies influenced etc.

Advantages:

Better information for decision makers; long term savings as a consequence of more accurate decision making.

Disadvantages:

Costs. High level of monitoring needs to satisfy both statutory requirements but must also be appropriate for how the data is used, especially in terms of specific studies.

Implementation

5.57 A range of agencies would need to be involved in the research project, including farmers, local authorities, MAFF, NRA, universities, communities, and other central government agencies. A funding agency would be required to provide the up-front costs of research. The NRA has a key role to play in influencing planning/development decisions and in long-term monitoring.

COMMUNICATION ISSUE

Overview

- 5.58 Good communication between the various groups involved in catchment management is required to ensure that the catchment is managed on a sustainable basis.

Issue

- 5.59 The actions of a range of individuals and user groups impact on the catchment and affect different uses. All groups, both statutory and non-governmental, need to communicate to ensure that development at the catchment scale is sustainable and that the ability of the ecosystem to support different uses is sustained. There is also a need to make communication at 'grass roots' level with the public as effective as possible.
- 5.60 A possible approach to encourage communication between the different 'players' in the catchment is for the NRA to facilitate a working group. This group could comprise representatives from the statutory agencies and leading interest groups.

Management Options

- 5.61 The catchment lies within NRA-TR West area. It is hoped that this more 'local' focus makes the NRA's ability to communicate and respond more effective. Views are sought on the merits of the NRA leading a 'catchment working group' or other similar groups. The NRA is committed to producing annual reviews of the Catchment Management Plan Final Report detailing data updates and the progress of actions. The NRA is also considering providing less formal, interim newsletters every six months.

Advantages:

There are a number of benefits to be obtained from a working party type of approach.

Disadvantages:

The working party needs to be carefully structured to ensure that all users have access to the resources necessary to enable them to contribute successfully to the decision making process. Also there is a current view that too many meetings are held as opposed to dedicating resources to more tangible actions. Increased public relations also needs the provision of considerable resources.

Implementation

- 5.62 All interested parties have a role in the establishment and success of a system of working groups.

- 5.63 SUMMARY OF KEY ISSUES (see Figure 26)
- A River Levels and flows eg River Coln
 - B Meysey Hampton Abstraction
 - C Latton Abstraction
 - D Baunton Abstraction
 - E Setting Water Quality Objectives*
 - F River Ray designated 'sensitive water' under the UWWTD
 - G NVZ proposed at Fairford
 - H Localised flooding at Ashton Keynes
 - I Localised flooding at Somerford Keynes
 - J Localised flooding at South Cerney
 - K Biomass targets not being achieved on the River Churn
 - L Biomass targets not being achieved on the River Cole
 - M Biomass targets not being achieved on the River Ray
 - N Biomass targets not being achieved on the River Thames
 - O Biomass targets not being achieved on the Ampney Brook
 - P Cotswolds Water Park (various multifaceted issues)
 - Q Future Gravel extraction eg Down Ampney area
 - R Restoration of the Thames & Severn canal
 - S Restoration of the Wilts & Berks canal
 - T Development pressure and water resources needs in Swindon
 - U Integrated management*
 - V Need for effective communication*
- * not shown on figure.

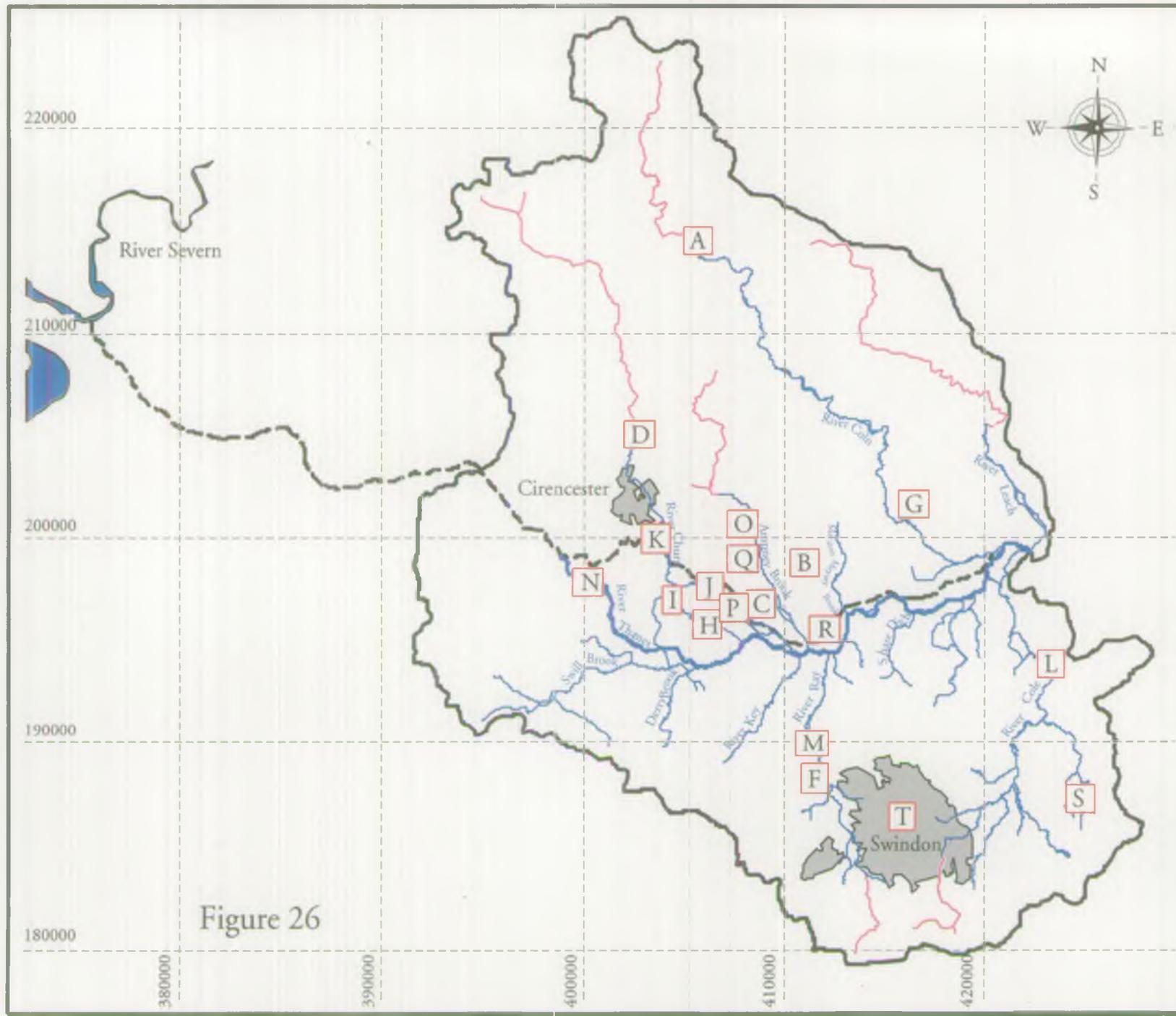


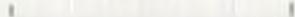
Figure 26

Upper Thames CMP:

Key Issues

-  CMP Boundary
-  Urban Areas
-  River Thames
-  Main River
-  Additional River Stretches
-  Thames-Severn Canal
-  Catchment Issues (a - t)
See Text

Scale:-
10km




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SECTION 6

NEXT STEPS

6. THE NEXT STEPS

6.1 This document has been produced through internal discussion, informal liaison with a wide range of organisations (see Appendix A) 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 quoted, there may be a number of omissions and inaccuracies. The next step, therefore, is to consult formally with organisations, groups and individuals interested in the future of the catchment's water environment. Consultation will enable the NRA to:

- clarify the extent and distribution of current uses of the catchment;
- assess the importance of catchment uses and values;
- identify the wide range of likely, possible and potential future catchment uses;
- expose catchment-specific issues to a wide audience; and,
- 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. To aid this process a Consultation Report Response Questionnaire has been provided. In particular the following questions should be considered:

- have the current and future uses and values of the catchment been correctly identified?
- have the issues been fairly addressed and what opinions do you have on them and the options for action proposed?
- have any issues been missed?
- 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:

**Mr J A Hamid
Upper Thames Catchment Management Plan
National Rivers Authority Thames Region
Isis House
Howbery Park
Wallingford
Oxon OX10 8BD**

6.5 The Project Manager for the CMP, Jamal A Hamid or Michelle Doyle (Catchment Planning Officer), can be contacted on (01734) 533304/11. All comments must be with us by 31 March 1995.

- 6.6 The consultation phase incorporates a number of separate but linked activities. These include:
- a launch using news, radio and television releases;
 - distribution of the full plan and/or a summary leaflet to key organisations, groups and individuals;
 - a display for use in libraries and other public areas; and,
 - public meetings as appropriate.
- 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 Report 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 NRA, in partnership with other organisations, will aim to pursue and implement these actions. An annual review will be undertaken to monitor progress and circulated to interested parties. It is envisaged that the CMP for each catchment would be updated approximately every five years (involving the entire process being repeated).
- 6.9 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 Upper Thames Catchment can be developed.

A PPENDICES

APPENDIX A - RESULTS OF INFORMAL LIAISON

A.1 A total of 214 organisations were consulted during an informal consultation exercise regarding this CMP. Of these organisations, 25% responded with either issues regarding the catchment area or just to acknowledge that although they did not have any observations at this stage, but would like to be consulted at a later stage of the Plan. Over half of these responses were received from County, District and Parish Councils. The following provides a summary of the issues raised during this informal consultation exercise (not all correspondence received is mentioned):

PARISH AND TOWN COUNCILS

- Low water levels in rivers and brooks, ie:
 - Ampney Brook
 - River Coln
 - River Churn
 - River Leach.
- Great Oolite aquifer being over abstracted;
- concerns about abstraction from rivers for domestic/commercial supply;
- choking of rivers by weeds;
- effects of gravel extraction in Cotswold Water Park on water levels;
- flood risks from River Thames after gravel working;
- water quality in rivers/brooks, ie Tuckmill Brook;
- diminishing wildlife especially birds;
- need for water supply reserves in time of drought.

LOCAL AUTHORITIES (County/District Councils)

- Excessive water abstraction from Oolites;
- lowered river levels and low stream flows;
- concern over provision of adequate water supplies;
- need for positive environmental protection policies and practices;
- protect pure water resources in gravels;
- concern over nitrate/phosphate levels in rivers;
- restrain building on floodplain;
- promote access for recreation/leisure along riverside paths;
- concern over flooding;
- need for river management, eg weeds, dredging;
- preservation of river banks, eg Coln, to prevent flooding;
- importance of Cotswold Water Park for nature conservation, recreation and mineral extraction;
- support restoration of canal network.

MAFF

- Agricultural land use;
- NVZs;
- ESAs;
- Water Level Management Plans.

LANDOWNERS (through Country Landowners Association)

- Prevent pollution of springs flowing into Coln;
- concern over lowered water levels in springs, Ampney Brook and Rivers Thames, Churn, Coln, Leach and Swill Brook;
- need for river management, eg weed clearing;
- concern over sudden rises in level in Thames and the resulting flooding of crops;
- concern over impacts of abstraction by TWUL at Baunton especially during droughts;
- the impacts of the reservoir proposal in south west Oxfordshire;
- fertiliser run-off and associated effects on the river ecosystems;
- ecological deterioration/loss of wildlife as a result of lowered water levels in streams etc;
- deteriorating river quality affecting fisheries;
- access needs to be recognised not only near large settlements and River Thames, but also in rural areas and around streams;
- perceived threat of major water transfer scheme on the environment.

INTEREST GROUPS/NON-GOVERNMENT ORGANISATIONS*Great Western Community Forest*

- Concern over nitrate and phosphate levels, pesticides, agricultural and urban area run-off and resulting pollution in rivers;
- loss of herb-rich meadows in river corridors;
- reduction in wildlife;
- promote waterside landscapes, countryside stewardship and river restoration projects;
- need for more natural river landscapes for wildlife and recreation;
- safeguard recreation routes, eg , along Rivers Ray and Cole;

Thames Water

- The CMP should reflect realities of funding, timescales and priorities. Costs and benefits, nature and timing of improvements should be identified.

Angling Interests

Restrict abstraction licences from the Thames tributaries to prescribed flows;

- impacts of flood management on the fishery;
- concern over quality of tributaries (Thames).

CCT

- Thames & Severn canal - could relieve flooding;
- proposal to back pump water up the canal to provide water for navigation and increase low flows in Thames Head waters, thereby avoiding water resource conflicts.

NFU

- interested in effects on water quality of agricultural run-off and sewage sludge;
- water availability and abstraction licensing.

CPRE

- Limit abstraction/impacts on river flows;
- protect water quality and wildlife;
- restrain development if water supply infrastructure is out of phase.

National Trust

- Mention Countryside Stewardship Schemes and Rivers Restoration Project.

Friends of the Earth

- Important issues include:

Low flows	Contaminated Land
Development on floodplains	Eutrophication
Recreation impact	Waterlogged soils
Monitoring	ESAs and Nitrate SAs
Protection of potable sources	Landfill and minerals industry
Water quality issues	

RSPB

- Safeguard habitat for breeding birds, invertebrates and aquatic plants in Cotswold Water Park;
- create wetland habitats, grassland and reedbeds in Cotswold Water Park;
- safeguard SSSIs;
- include a commitment to prepare and implement water level management plans for important wetland wildlife sites;
- have regard to Environmental Procedures for Inland Flood Defence Works.

British Canoe Union

- Acknowledge canoeing on water sites in catchment and also potential for additional sites. Rivers Thames, Ray, Churn and Cole are used by canoes;
- access agreements on all canoeable rivers are desirable;
- recognition by NRA of the need for more access for recreation purposes to land held by NRA;
- correlate fees paid by canoeists on River Thames with development of canoe-site facilities;
- prevent changes in river engineering (weirs and sluices etc) which jeopardise canoeing activity;
- water quality.

English Nature

- Use of aquatic herbicide at the Cotswold Water Park;
- water quality at the Water Park in relation to increased development taking place here and changes in run-off;
- minimum intervention on the Swill Brook, and Rivers Ray, Coln and Churn so as to maintain as natural a profile and flow as possible;
- target areas for water level enhancement to recreate wetland habitats, eg , for breeding waders;
- native crayfish populations need to be maintained - strategy for crayfish farms;
- intrusion of new fish farms into floodplain and possible loss of wet grassland;

- encourage natural otter recolonisation rather than deliberate reintroductions;
- Upper Thames navigation - impact of restoration of river navigation and linkage to restoration of Thames & Severn canal.

CWP Villages Society

- Frequent flooding in the area of Somerford Keynes and Ashton Keynes.

River Thames Society

- Potential impact of the renovated canal;
- conflicts between those using old gravel workings for aquatic sports and the needs of the wildlife.

APPENDIX B - GLOSSARY

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)
	1 mile = 1.609 km
Area:	10 000 m ² = 1 ha (equivalent to 2.47 acres)
Density:	1 000 ng/l = 1 ug/l (equivalent to 3.53 x 10 ⁸ ounces)
	1 000 ug/l = 1 mg/l (equivalent to 3.53 x 10 ⁵ ounces)
Flow:	1 000 l/s = 1 m ³ /s (equivalent to 35.31 cusecs)
	1 000 m ³ /d = 11.6 l/s (equivalent to 0.41 cusecs)
	1 Ml/d = 11.57 l/s (equivalent to 0.220 mgd)
	(cusec = cubic metres per second)

<i>Abstraction</i>	Removal of water from surface or groundwater, usually by pumping.
<i>Abstraction Licence</i>	Licence issued by the NRA under Section 38 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 as designated by the Countryside Commission.
<i>Aquifer</i>	A layer of underground porous rock which contains water and allows water to flow through it.
<i>Baseflow</i>	That part of the flow in a watercourse made up of groundwater and discharges. It sustains the watercourse in dry weather.
<i>Biochemical Oxygen Demand (BOD)</i>	A measure of the amount of oxygen consumed in water, usually as a result of organic pollution.
<i>Bifurcation</i>	Division into two branches (fork).
<i>Catchment</i>	Area from which river systems, lakes and reservoirs collect water.
<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>County Structure Plans</i>	Statutory documents produced by County Councils (CC) 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>Directive</i>	A type of 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 (DC/BC) 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>EA</i>	Environmental Assessment
<i>EC</i>	European Commission (European Union, EU)
<i>ESA</i>	Environmentally Sensitive Area
<i>Eutrophic/Eutrophication</i>	The enrichment of water by nutrients, especially compounds of nitrogen and/or phosphorus, causing an accelerated growth of algae and higher forms of plant life to produce an undesirable disturbance to the balance of organisms present in the water and the quality of the water concerned.
<i>Floodplain</i>	This includes all land (and washlands) adjacent to a watercourse over which water flows or would flow but for flood defences in times of flood.
<i>GIS</i>	Geographical Information System
<i>Groundwater</i>	Underground water contained in the pores and fissures of aquifers (water-bearing strata).

<i>Invertebrate Fauna</i>	Animals which lack a vertebral column - used for biological classification. Especially macroinvertebrates (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>	Vascular aquatic plants visible to the naked eye.
<i>MAFF</i>	Ministry of Agriculture, Fisheries and Food.
<i>Main River</i>	Some watercourses are designated as 'Main River' - this status 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 such rivers.
<i>MoD</i>	Ministry of Defence
<i>NRA-TR</i>	National Rivers Authority - Thames Region
<i>Percolation</i>	The descent of water through soil pores and rock crevices.
<i>Potable Water</i>	Water suitable for human consumption.
<i>Prescribed Flow (Flow Constraint)</i>	A river flow incorporated as a condition in an abstraction licence, such that abstraction must cease once the flow falls below this value.
<i>RAMSAR</i>	Name of the place in Israel where an international convention agreed that members (including the NRA) would designate wetland sites of national or international importance.
<i>Riparian Owner</i>	A person/organisation with property rights on a river bank.
<i>River Corridor</i>	Of particular importance to the NRA, such a corridor is a continuous area of land which has visual, physical or ecological links to a watercourse and is dependent on the quality or level of water within the Channel.
<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>RIVPACS</i>	The River Invertebrate Prediction and classification Scheme. This is a technique for modelling the expected invertebrate community of any particular watercourse based on its physical and chemical characteristics.
<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>	Temporary withdrawal of agricultural land from agricultural production.
<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 because it is particularly important, on account of its conservation value.
<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 traditional piped drainage and sewer systems of urban areas
<i>SPA</i>	Special Protection Area (in terms of birdlife)
<i>Springs</i>	Natural emergence of groundwater at the surface.
<i>STW</i>	Sewage Treatment Works
<i>SWQO</i>	Statutory 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>UWWTD</i>	Urban Wastewater Treatment Directive
<i>Watercourse</i>	A stream, river, canal or the channel, bed or route along which they flow.

APPENDIX C - DESCRIPTION OF RESPONSIBILITIES

INTRODUCTION

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

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

The NRA has the primary responsibility for flood defence and land drainage matters but on 'ordinary watercourses' the responsible land drainage and flood defence agency is the District or Borough Councils, who may also manage on behalf of water and sewerage undertakers surface water drains leading to rivers and watercourses.

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

Water and Sewerage Undertakers

These private companies are responsible for providing water supplies and the management of STWs. Thames Water Utilities Ltd and Wessex Water provide services to the catchment area.

Her Majesty's Inspectorate of Pollution (HMIP)

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

Drinking Water Inspectorate (DWI)

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

Office of Water Services (OFWAT)

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

District or Borough Councils

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

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

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 dischargers pay the costs of the consequences of their discharges, and, as far as possible, recover the costs of water environment improvements from those who benefit.*
- *to improve public understanding of the water environment and the NRA's work.*
- *to improve efficiency in the exercise of the NRA's functions and to provide challenge and opportunity for employees and show concern for their welfare.*

Water Resources

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

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

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

Water Quality

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

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

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

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

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

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

Conservation

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.

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.

Recreation

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.

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

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

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

Fisheries

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

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

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

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

Flood Defence

The NRA has powers to:

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

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

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

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

Navigation

Our future strategy 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 navigations for which the NRA is the navigation authority or has powers, and to manage the inter-relationship of navigation with other core functions of the NRA.

Land Use Planning

The NRA is a statutory consultee of the land use planning system and seeks to ensure that local authorities take into account the needs of the water environment when preparing development plans and determining planning applications.

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

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

Summary

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

APPENDIX D - SUPPORTING DATA AND STANDARDS

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	0.60
Fair	C	60	6.0	1.30
Fair	D	50	8.0	2.50
Poor	E	20	15.0	9.00
Bad	F ⁽²⁾	-	-	-

Notes:

⁽¹⁾ as suppressed by adding allyl thio-urea

⁽²⁾ 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	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
	% saturation 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	0.60	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	1.30	0.021	6.0 - 9.0	≤10 >10 and ≤50 >50 and ≤100 >100	5 22 40 112	300 700 1000 2000
RE4	50	8.0	2.50	-	6.0 - 9.0	≤10 >10 and ≤50 >50 and ≤100 >100	5 22 40 112	300 700 1000 2000
RE5	20	15.0	9.00	-	-	-	-	-

Note:

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

BMWP Scores at Each Site (1992/93 Data)

Site	Reach	Score	Achieves Target Class
Ampney Brook	At Sheeppen Bridge	161	Y
Blunsden Brook	At Roadbridge, Water Eaton	42	N
Broadwell Brook	At Friars Court, Clanfield	106	Y
Bydemill Brook	Above Thames	43	N
Cerney Wick Brook	At Spine Road, South Cerney	116	Y
Churn	At North Cerney	202	Y
Churn	At Gauging Station, Cerney Wick	192	Y
Cole	At B4019, Coleshill	153	Y
Coln	At Fossebridge	160	Y
Coln	At Gauging Station, Bibury	166	Y
Coln	At Roundhouse, Lechlade	104	Y
Derry Brook	At Roadbridge, Ashton Keynes	81	Y
Dudgrove Stream	At Gate 7, RAF Fairford	89	Y
Haydon Wick Brook	Above Ray, Haydon Wick	42	N
Highmoor Brook	Below Norton Ditch	39	N
Key	At A419 Roadbridge, Cricklade	39	N
Leach	At B4449, Lechlade	164	Y
Lenta Brook	At Hinton Marsh Farm	65	N
Lenta Brook (East)	At A420 Roadbridge	23	N
Lertwell Brook	Near Zulu Buildings, B400	52	N
Liden Brook	Opp. Lower Earls court Fm Building	63	N
Lydiard Brook	Above Ray (Wilts)	93	Y
Marston Meysey Bk	At R/b below Marston Meysey	90	Y
Ray	At Moredon Bridge, Swindon	57	N
Ray	At Morris Street, Swindon	75	N
Ray	At Seven Bridges, Cricklade	80	N
Share Ditch	At Roadbridge, Castle Eaton	38	N
South Marston Brook	At Nightingale Lane, South Marston	63	N
Swill Brook	At High Bridge, Ashton Keynes	160	Y
Thames	At Eysey	184	Y
Thames	At Water Intake, Buscot	127	Y
Tuckmill Brook	Above Shrivensham STW	79	N
Tuckmill Brook	75 m below Shrivensham STW	48	N
Veneymore Stream	Below Little Faringdon Trout Fm	96	Y
Waterloo Ditch	At Coleshill	82	Y
Wroughton Ditch	Below Wroughton STW	46	N

Microbiological Surveillance of the Upper Thames Catchment 1991-94 (Including a Subjective Assessment of Levels of Bacterial Contamination)

Watercourse	Number of Samples						Problem Areas
	Number of Sites Sampled	Total	Background Levels Present	Treated Sewage Present	Poorly Treated Sewage	Gross Faecal Contamination	
Thames	8	155	96	55	4	0	downstream Ashton Keynes S.T.W.
Swill Brook	1	4	3	1	0	0	
Derry Brook	1	4	4	0	0	0	
Cerney Wick Brook	1	18	6	9	3	0	South Cerney
Churn	7	24	19	5	0	0	
Key	1	4	2	2	0	0	
Ray (Wilts)	6	32	0	28	3	1	Whole length downstream Wroughton Ditch
Lydiard Brook	1	4	3	1	0	0	
Coln	13	66	42	22	2	0	Withington, Fossebridge
Shipton Stream	1	4	1	3	0	0	Shipton Solers
Cole	2	2	2	0	0	0	
Dorcan Brook	1	1	1	0	0	0	
South Marston Brook	1	1	1	0	0	0	
Lertwell Brook	1	1	1	0	0	0	
Tuckmill Brook	2	2	2	0	0	0	

NRA DEFINITIONS OF POLLUTION INCIDENT CATEGORIES

MAJOR

A major incident involving one or more of the following:

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

SIGNIFICANT

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

MINOR

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

POLLUTION PROSECUTIONS AND CAUTIONS (1990-94)

NAME	LOCATION	DATE OF INCIDENT	FINE	TYPE OF POLLUTION
Mr R Archard	Share Ditch, Castle Eaton	12/3/90	£250	Slurry
TWUL	R Ray, Swindon	30/6/90 - 1/7/91	£5000	Sewage Effluent
Mr P H Crocker	Hykemeris Stream, Upper Minety	19/2/91	£500	Slurry
Mr P H Crocker	Hykemeris Stream, Upper Minety	19/4/91	£500	Slurry
Moreton C Cullimore Ltd	Swill Brook, Ashton Keynes	9/4/91	£500	Silt
Mr R Klindt	Bydemill Brook, Hannington	26/5/91	£2000	Slurry
Mr J D Jenkinson	Trib. River Thames, Lechlade	25/6/91	£500	Silage
Mr B Hinton	R Churn, Cockleford	17/10/91	£350	Sewage Effluent
Mr B Hinton	R Churn, Cockleford	6/1/92	£350	Sewage Effluent
Mr P Francis	Haydon Wick Brook, Haydon Wick	27/1/93	£750	Gas Oil

Flood Defence Levels of Service - Land Use bands (LUB)

Reach No.	Reach Length (km)	Downstream name	Upstream name	LUB	Catchment No.
1	5.364	SWILL BROOK	MRL	D	1
1	4.185	HYKEMERES STREAM	MRL	D	1
1	3.472	SWILL BROOK	MRL	D	1
1	1.569	SWILL BROOK	MRL	E	1
1	0.499	LEIGHFIELD BROOK	MRL	D	1
1	7.417	R.THAMES	MRL	D	1
2	4.848	SWILL BROOK BRIDGE	PILL BRIDGE	E	1
43	6.736	CASTLE EATON BRIDGE	TN BRIDGE CRICK.	C	1
46	8.220	NEIGH BRIDGE	MRL THAMES HEAD	D	1
44	4.928	TOWN BR. CRICKLADE	WATERLAY BRIDGE	C	1
45	5.954	WATERLAY BRIDGE	NEIGH BRIDGE	C	1
1	3.882	SWILL BROOK	MRL	E	1
1	3.486	R.THAMES	CERNEYWICK BROOK	E	1
1	5.156	R.THAMES	ASHTON FIELD BROOK	B	1
1	4.345	R.THAMES	SWILL BROOK BRIDGE	D	1
3	3.870	PILL BRIDGE	MRL	E	1
3	7.253	RAILWAY-DISMANTLED	MRL	C	2
1	5.350	R.THAMES	ROADWAY	D	2
2	6.115	ROADWAY	RAILWAY (DISM)	D	2
1	1.795	R.RAY	MRL	E	3
1	2.075	R.RAY	MRL	E	3
2	5.909	TADPOLE BRIDGE	RAILWAY	D	3
3	3.536	RAILWAY	MRL	D	3
1	0.742	LYDIARD BRIDGE	MRL	E	3
1	3.749	R.RAY	MRL	C	3
1	1.395	R.RAY	MRL	E	3
1	2.063	R.RAY	MRL	E	3
1	4.072	R.THAMES	TADPOLE BRIDGE	D	3
1	5.716	R.THAMES	DRAIN CONE/FOX COV.	D	4
2	5.335	DRAIN CONE/FOX COV	MRL	E	4
1	2.234	R.THAMES	MRL	E	5
1	0.875	SHARE DITCH	MRL	E	5
1	1.808	R.THAMES	MRL	D	5
1	5.840	R.THAMES	MRL	E	5
1	5.231	R.THAMES	MRL	E	5
1	2.766	BYDEMILL BRIDGE	MRL	E	5
2	6.086	FOOTBRIDGE	MRL	E	5
1	2.771	R.THAMES	FOOTBRIDGE	E	5
40	4.344	GRAFTON WEIR	ST JOHNS WEIR (MAIN)	C	5
42	5.867	HANNINGT'WICK DT.	CASTLE EATON BR.	C	5
41	5.650	ST JOHNS WEIR(MAIN)	HANNINGTONW. DT.	C	5
1	5.085	R.THAMES	WHELFORD MILL	C	6
2	4.991	WHELFORD MILL	FOOTBRIDGE	C	6
3	5.026	FOOTBRIDGE	ROADWAY	E	6
4	5.195	ROADWAY	A433	E	6
5	5.623	A433	FOOTBRIDGE	D	6
6	4.216	FOOTBRIDGE	STOWELL MILL	E	6
7	5.482	STOWELL MILL	MRL	E	6
1	5.759	R.THAMES	FOOTBRIDGE	C	7
2	5.116	FOOTBRIDGE	COLESHILL BRIDGE	E	7
3	4.756	COLESHILL BRIDGE	B4000	D	7
4	5.341	B4000	DORCAN BROOK	D	7
1	3.891	R.COLE	MRL	E	7
1	2.043	LENTA BROOK	MRL	E	7
1	0.730	TUCKMILL BROOK	MRL	D	7
1	2.110	TUCKMILL BROOK	MRL	E	7
1	4.433	R.COLE	MRL	E	7
1	3.264	R.COLE	MRL	E	7
1	1.384	TUCKMILL BROOK	RAGNALL BROOK	E	7
1	2.717	R.COLE	A420	E	7
2	2.040	A420	RAILWAY	E	7
3	3.083	RAILWAY	MRL	D	7
5	3.108	DORCAN BROOK	MRL	E	7
1	5.625	R.COLE	MRL	E	7
1	1.429	STAINSWICK BRIDGE	MRL	D	7
1	4.623	R.THAMES	VENEYMORE STREAM	C	8
2	5.048	VENEYMORE STREAM	WEIR MRL	D	8
1	2.295	RADCOT CUT	R.LEACH	E	8

MRL Main River Length

STANDARDS OF SERVICE FOR FLOOD DEFENCE AND LAND DRAINAGE

Land Use Band (LUB)	Description of Typical Land Use	Target Standards of Service
A	A reach containing the urban elements of residential and non-residential property distributed over a significant proportion of its length, or densely populated areas over some of its length. Any agricultural influence is likely to be over-ridden by urban interests. Amenity uses such as parks and sports fields may be prominent in view of the floodplains proximity to areas of population density.	These heavily built-up areas should be protected to a standard such that the risk of flooding in any one year is no greater than 1 in 50. In some areas higher standards may be applied.
B	Reaches containing residential and/or non-residential property either distributed over the full length of the reach or concentrated in parts but characterised by lower densities than Band A.	Buildings should be protected to a standard such that the risk of flooding in any one year is between 1 in 20 and 1 in 50. However, agricultural or amenity land found in these areas should remain susceptible to regular flooding.
C	Limited numbers of isolated rural communities or urban fringe at risk from flooding, including both residential and commercial interests. Intensive agricultural use could also be included.	The chance of flooding of property in any one year would be between 1 in 10 and 1 in 50 years. Agricultural or amenity land, however, could be susceptible to more regular flooding.
D	Isolated, but limited number of residential and commercial properties at risk from flooding. Agricultural use will probably be the main customer interest with arable farming being a feature. In undeveloped pockets of largely urban use, amenity interests may be prominent.	Agriculture and amenity land in this band should be protected to a standard such that the chance of flooding or prolonged bankfull events in any one year, at a time when crops are normally susceptible to damage (ie March to October inclusive), is between 1 in 2 and 1 in 5.
E	There are likely to be many properties and major roads at risk from flooding in these reaches. Agricultural use will be the main customer interest with either extensive grassland or, where the floodplain extent is small, arable cropping being the most common land uses. Amenity interests are likely to be limited to public footpaths along or across the river.	Agricultural land in this category could be susceptible to yearly waterlogging and/or flooding, possibly occurring on several occasions throughout the year. Protection should be maintained to a standard which reduces the risk of either type of event to between one and three times per year at a time when crops are normally susceptible to damage.

NOTES