

local environment agency plan

NORTH SOMERSET RIVERS

CONSULTATION REPORT

DECEMBER 1997



ENVIRONMENT
AGENCY



ENVIRONMENT AGENCY

NATIONAL LIBRARY &
INFORMATION SERVICE

SOUTH WEST REGION

Manley House, Kestrel Way,
Exeter EX2 7LQ

Foreword

This Local Environment Agency Plan (LEAP) Consultation Report represents a significant step forward in tackling environmental issues. It has been clear for many years that the problems of land, air and water, particularly in the realm of pollution control, cannot be adequately addressed individually. They are interdependent; each affecting the others. The creation of the Environment Agency with the responsibilities for all three media provided a major opportunity to take a holistic approach which is now reflected in this LEAP Consultation Report.

The Plan area includes the seaside resorts of Weston-super-Mare and Clevedon, a major port development at Portbury as well as the North Somerset Levels and Moors which are nationally important for nature conservation. Here in North Somerset we must not only protect wildlife and the environment from the growing pressures of development and tourism but seek opportunities to enhance them whenever we can.

The environmental challenges of the area are set out in the Plan in a way which has not been done before, raising important environmental issues which should now be addressed. It is, I believe, vital reading for everyone concerned with the environmental future of North Wessex.

We look forward to hearing your views on the many environmental issues discussed here and I hope that with the help of our partners we can progress towards a better environment for all who live and work in this area.



CHRIS BIRKS
AREA MANAGER (NORTH WESSEX)

YOUR VIEWS

We hope that this Consultation Report will be read by everyone who has an interest in the quality of the environment. Your views will help us to finalize the Action Plan.

Have we identified all the problems in the Plan Area?

Are there any issues which you would like to highlight?

Please send your written comments by **31 MARCH 1998** to:

Alan Turner, Team Leader LEAPs, Environment Agency, North Wessex Area, Rivers House,
East Quay, BRIDGWATER, Somerset, TA6 4YS. Tel: 01278 457333.

HOW TO USE THIS CONSULTATION REPORT

For advice on how to use this Consultation Report please see Part 1.

THE NEXT STAGE

We will collate responses to this Consultation Report and publish an Action Plan in summer 1998. Each year we will review the progress that has been made with the actions identified in the Action Plan and publish a brief review.

GENERAL ENQUIRIES

For general information about the work of the Environment Agency, or information about a specific matter, please contact our Customer Services Centre at the Bridgwater Office. Tel: 01278 457333.

Environment Agency Copyright Walver

This report is intended to be used widely and may be quoted, copied or reproduced in any way, provided that the extracts are not quoted out of context and that due acknowledgement is given to the Environment Agency.

Published December 1997

Contents

Vision	1
Part 1 - Introduction and Issues and Options	
1. How to use this Plan	2
2. Introduction	2
2.1 The Environment Agency	2
2.2 Environmental Standards	5
2.3 This Local Environment Agency Plan	5
2.4 The LEAP Area	6
3. Protection Through Partnership	7
3.1 Links with Local Authorities	7
3.2 Water Level Management Plans	9
3.3 Working with Businesses	9
3.4 Links with Government Bodies	9
3.5 Examples of Partnerships	10
4. Issues and Options	11
4.1 Issue - Development Pressure	11
4.2 Issue - Inadequate Flood Defences	13
4.3 Issue - Maintaining and Enhancing Biodiversity	13
4.4 Issue - The Decline in Water Quality	14
4.5 Issue - The Impact of River Regulation, Penning and Nutrient Enrichment	14
4.6 Issue - The Impact of River Maintenance	16
4.7 Issue - The Impact of Landfill Activities on Cold Bath Spring Public Water Supply Source	18
4.8 Issue - The Impact of Agricultural Discharges and Runoff	18
4.9 Issue - The Impact of Mushroom Farming	19
4.10 Issue - The Impact of the Unconsented Discharge from the Water Treatment Works at Barrow Reservoirs	19
4.11 Issue - The Impact of the Lack of Compensation Flow from Barrow Reservoirs	20
4.12 Issue - Use of Environment Agency Owned Land	20
Part 2 - Supporting Information	
5. The Physical Environment	21
5.1 Geology	21
5.2 Hydrology	21
5.3 Hydrogeology	21
6. Water Quality	24
6.1 Our Proposed Targets for River Water Quality	24
6.2 River Quality Objective Compliance	26
6.3 EC Bathing Waters Directive	29
6.4 EC Freshwater Fish Directive	29
6.5 EC Nitrates Directive	30
6.6 EC Surface Water Abstraction Directive	30
6.7 EC Dangerous Substances Directive	30
6.8 EC Urban Waste Water Treatment Directive	31
6.9 EC Shellfish Waters Directive	31
6.10 EC Shellfish Hygiene Directive	31
6.11 EC Groundwater Directive	33
6.12 Biological Quality	33

7. Groundwater Protection	34
8. Air Quality.....	36
8.1 Monitoring.....	36
8.2 National Air Quality Strategy.....	36
8.3 Local Air Quality Management Areas.....	36
8.4 Ground Level Ozone	37
8.5 Volatile Organic Compounds.....	37
8.6 Sulphur Dioxide	37
8.7 Nitrogen Dioxide	38
8.8 Acid Rain	38
8.9 Benzene	38
9. Landscape	41
10. Wildlife	43
10.1 Designated areas.....	43
10.2 Habitats.....	43
10.3 Biodiversity	43
10.4 Survey Information	45
10.5 Important Species.....	45
10.6 North Somerset Levels and Moors Project.....	46
10.7 Other Wildlife Projects.....	46
10.8 Water Levels and Ecology	47
10.9 Invasive Plants.....	47
11. Archaeology.....	50
12. Fisheries	51
12.1 Fish Populations	51
12.2 Angling	51
12.3 Commercial Fishing for Wild Fish Stocks	51
13. Recreation	54
14. Mineral Extraction.....	56
15. The Management of Waste.....	59
15.1 Waste Arisings.....	60
15.2 Waste Management Sites	61
15.3 Waste Planning	61
16. Contaminated Land	61
17. Flood Defence and Land Drainage	62
17.1 Flood Risk and Development	62
17.2 Maintaining River and Flood Defence Structures	62
17.3 Flood Warning	64
17.4 Improvements.....	64
17.5 Shoreline Management Plans	66
17.6 Water Level Management Plans	66
18. Development and the Environment.....	69
19. Water Abstraction and Supply	70
19.1 Public Water Supply.....	72
19.2 Private Water Use	73

20. Aqueous Discharges	74
20.1 Continuous Discharges.....	74
20.2 Intermittent Discharges.....	76
20.3 Discharges to Ground.....	76
21. Aquaculture	77
22. Farming and Forestry	77
22.1 Farming.....	77
22.2 Forestry.....	78
23. Controlled Industrial Processes	80

Part 3 - Appendices

24. Radioactive Substances	81
25. Area Environment Group	82
26. Steering Group	82
26.1 Public Registers and Access to Environmental Information.....	83
27. Glossary	83
28. Units	84
29. References	84

Maps

Map 1 - North Somerset Rivers Catchment Location	vi
Map 2 - North Somerset Rivers Catchment.....	8
Map 3 - Simplified Geology and Hydrogeology	22
Map 4 - Hydrometric Network (Isohyets, River Flow Stations & Rain-gauges)	23
Map 5 - Proposed River Quality Objectives (River Ecosystem Classification 1996)).....	25
Map 6 - Compliance with Proposed River Quality Objectives (River Ecosystem Classification 1996)	27
Map 7 - EC Directives Monitoring	28
Map 8 - Biological Water Quality - 1995	32
Map 9 - Groundwater Source Protection Areas	35
Map 10 - Exceedences of Critical Loads of Acidity for Soils	39
Map 11 - Designated Landscape	40
Map 12 - Conservation Resource Map 1	42
Map 13 - Conservation Resource Map 2	44
Map 14 - Water Levels.....	48
Map 15 - Managed/Natural Rivers	49
Map 16 - Fisheries	52
Map 17 - Angling	53
Map 18 - Recreation	55
Map 19 - Mineral Extraction.....	57
Map 20 - Waste Disposal.....	58
Map 21 - Flood Defence Flood Risk Areas and Water Control	63
Map 22 - Main River and Internal Drainage Boards.....	65
Map 23 - Built Environment and Development.....	68
Map 24 - Surface Water and Groundwater Abstractions	71
Map 25 - Effluent Disposal	75
Map 26 - Woodland	79

Tables

Table 1 Non-Compliant Stretches (1996 RE Class) in the North Somerset Rivers Catchment	26
Table 2 Compliance with Imperative Standards of the EC Freshwater Fish Directive 1993 - 1995 - Cyprinid.....	29
Table 3 Compliance with Imperative Standards of the EC Freshwater Fish Directive 1993 - 1995 - Salmonid	29
Table 4 Dangerous Substances Monitoring Sites Downstream of Registered Discharges: 1996 - List II	31
Table 5 Biological Class Descriptions	33
Table 6 Ground Level Ozone Bristol City Centre	37
Table 7 Sulphur Dioxide Annual Mean Concentration, Bristol	38
Table 8 Flood Warnings Issued	64
Table 9 Standards of Service Land Use Bands and Targets	66
Table 10 Local Plans Covering the North Somerset Rivers Catchment	69
Table 11 Groundwater Abstractions	70
Table 12 Surface Water Abstractions.....	70
Table 13 Public Water Supply Authorized Abstractions.....	72
Table 14 Land Use Type	77
Table 15 Part A Process Operators.....	80
Table 16 Current Registered Users of Radioactive Substances	81

Map 1 - North Somerset Rivers Catchment Location



North Somerset Rivers Local Environment Agency Plan

vision

Our vision for this local area is to provide a better environment for present and future generations. To achieve this:

- we want an environment where the pressures of tourism, housing, industry and agriculture are managed to maintain and where possible enhance the exceptional conservation value of this area
- we want to achieve a much more efficient use of water to reduce abstraction and increase flows in our lowland rivers
- we want to achieve 100% compliance with water quality standards to protect wildlife, public water supply and other uses of water
- we want local biodiversity targets to be set and achieved to protect the variety of our wildlife in this area
- we want waste minimization targets to be achieved locally to significantly reduce the impact of waste disposal on the environment
- we want acceptable levels of flood protection with minimum cost to the community
- we want people living and working in the area to have a high level of environmental awareness to work with the authorities to achieve a more sustainable lifestyle

This is a **draft** vision statement. We welcome your suggestions to improve and extend this vision statement. What is your vision for the area in, for example, 2010?

Part 1

1. How to use this Plan

This Plan is split into three parts:

Part 1 contains:

- this Introduction.
- a general description of the Plan Area
- the "Issues" that we have identified in our management of the Plan Area. "Options for Actions" for the resolution of these issues are also proposed but these are not exhaustive and we welcome your suggestions for other issues to include in our Action Plan
- "Protection through Partnership" which outlines the work that we do in collaboration with other organizations and where the work of other organizations plays an important part in helping us to achieve some of our aims and objectives.

Part 2 contains:

- a detailed account of catchment uses and activities. This forms a useful reference document and will provide background information relevant to the issues identified in Part 1.

Part 3 contains:

- technical appendices including UK legislation, references and a glossary of terms.

PLEASE USE THE CONTENTS TABLE

If the size of the document is daunting, choose only those parts which interest you. You can dip into the rest at a later date.

2. Introduction

2.1 The Environment Agency

2.1.1 Who are we?

The Environment Agency is a non-departmental public body established by the Environment Act 1995 and formed on 1 April 1996. We are sponsored by the Department of the Environment, Transport and the Regions (DETR) with policy links to the Welsh Office and the Ministry of Agriculture, Fisheries and Food (MAFF).

We have taken over the functions of our predecessors: the National Rivers Authority (NRA), Her Majesty's Inspectorate of Pollution (HMIP), the Waste Regulation Authorities (WRAs) and some parts of the DETR.

We provide a comprehensive approach to the protection of the environment by combining the regulation of air, land and water into a single organization. We cannot work in isolation, but seek to educate and influence individuals, groups and industries to promote best environmental practice, and develop a wider public awareness of environmental issues.

Our Vision is:

- a better environment in England and Wales for present and future generations.

We will:

- protect and improve the environment as a whole by effective regulation, by our own actions and by working with and influencing others
- operate openly and consult widely
- value our employees
- be efficient and businesslike in everything we do.

Our Aims are:

- to achieve significant and continuous improvement in the quality of air, land and water, actively encouraging the conservation of natural resources, flora and fauna
- to maximize the benefits of integrated pollution control and integrated river basin management
- 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 achieve significant reductions in waste through minimization, reuse and recycling and to improve standards of disposal
- to manage water resources to achieve the proper balance between the needs of the environment and those of abstractors and other water users
- to secure, with others, the remediation of contaminated land
- to improve and develop salmon and freshwater fisheries
- to conserve and enhance inland and coastal waters and their use for recreation
- to maintain and improve non-marine navigation
- to develop a better informed public through open debate, the provision of soundly based information and rigorous research
- to set priorities and propose solutions that do not impose excessive costs on society.

2.1.2 Sustainable development

In 1987, the World Commission on Environment and Development (the Brundtland Commission) defined sustainable development as that *which meets the needs of the present without compromising the ability of future generations to meet their own needs.*

Sustainable development brings together four sets of values: environmental protection, providing for the future, quality of life, and fairness, to create a new policy which integrates environmental, developmental, social and economic concerns.

One of the primary reasons for setting up the Environment Agency was to provide a means of helping the government deliver its sustainable development strategy. Section 4 of the Environment Act (1995) defines the Agency's aims and states that *the minister shall give statutory guidance on objectives and the contribution to sustainable development*. Guidance has now been published, and the key elements are that the Agency should:

- take a holistic approach to the protection and enhancement of the environment
- take a long term perspective
- maintain biodiversity by exercising its statutory obligations with respect to conservation
- discharge its regulatory functions in partnerships with business in ways which maximize the scope for cost effective investment in improved technologies and management techniques
- provide high quality information and advice on the environment.

Our management of the catchment will take forward these key elements as our contribution towards sustainable development.

2.1.3 Our umbrella duties

There are a number of umbrella duties which we carry out for all our functions:

- **Rural Areas** - when considering any proposal, we must have regard to any effect which the proposals would have on economic and social well-being of local communities in rural areas. Some of our activities, such as meeting statutory objectives, emergency actions and the taking of legal actions are not subject to this appraisal.
- **Costs and Benefits** - we are required to take into account the likely costs and benefits when deciding whether to exercise our powers. Costs include both financial costs and costs to the environment; benefits include those which communities will enjoy, both now and in the future.
- **Conservation** - we must have regard to conservation in our pollution control functions, and we have a duty to further conservation in all our other functions. We also have a duty generally to promote the conservation of flora and fauna dependent on the aquatic environment.

2.1.4 What we do not do

We do not cover all areas of environmental law and service to the general public. We are not responsible for:

- noise problems (except if it is to do with our work)
- litter
- air pollution arising from vehicles, household areas, small businesses and small industries
- collecting waste in your local area
- planning permission
- environmental health and food hygiene

Your Local Authority deals with these issues and will contact us when necessary. The local authorities also deal with contaminated land issues by working with us.

We are not responsible for the quality or supply of drinking water or getting rid of sewage waste. You should contact your local water or sewerage companies for more details - you can find their details in your local phone directory.

2.2 Environmental Standards

There is a great deal of legislation that determines the way we operate and carry out our enforcement duties. The Environment Act 1995 provides some harmonisation of powers, but we also rely on existing legislation, including the Control of Pollution Act (1974), the Control of Pollution (amendment) Act (1989), the Environmental Protection Act (1990), the Radioactive Substances Act (1993), the Salmon and Freshwater Fisheries Act (1975), the Water Resources Act (1991), and the Land Drainage Act (1991).

We are the competent Authority for over 25 European Community Environmental Directives whilst a further 70 Directives affect our policies and activities. These include the Quality of Bathing Waters, Dangerous Substances, Industrial Plant Emissions, Waste Management Framework, Quality of Water to Protect Freshwater Fisheries, and the Urban Waste Water Treatment Directives.

Operational Standards are the technical, scientific and engineering procedures which are necessary to put legislation and our policy into practice. These take many forms, including policy statements, procedural manuals, and a suite of quantitative output and performance measures that we monitor quarterly or annually. Details of our operational standards are published in technical handbooks, research and development reports, and information leaflets. Further details are available from our Customer Service Centres at our local offices.

Failure to comply with standards has helped us to identify the issues raised in this Plan. Further detail on standards and compliance is available from the address given on the back of this Plan.

2.3 This Local Environment Agency Plan

This Local Environment Agency Plan (LEAP) slots into a sequence of Catchment Management Plans (CMPs) which were being prepared by the NRA to cover all river catchments in England and Wales. We will use LEAPs to cover the same topics as Catchment Management Plans but they will also deal with other topics to cover the full range of our responsibilities.

A holistic approach to environmental management is required to plan for sustainability and improvement. LEAPs allow the full range of management issues to be identified and considered within a geographical area which is both relevant and meaningful. They are strategic in nature, since individual catchments cover large areas of land, often straddling local authority boundaries.

Economic and political constraints will influence what we are able to do. For example the funds that the water service companies and other industries invest in pollution control will make a difference to the extent of water quality improvements that we are able to achieve. LEAPs help to prioritize the allocation of funds to secure actions on key issues.

2.3.1 The Area Environment Group and Steering Group

During the summer of 1996, we set up an Area Environment Group (AEG) for the North Wessex area. We regard the AEG as fundamental in assisting us in building relationships with local communities. The Group has 20 members (see Section 25) who have a broad experience and interest in environmental matters. The role of the AEG is to advise on proposals, priorities and key issues for LEAPs. The North Wessex Area Environment Group has agreed the creation of a Steering Group for each LEAP to provide detailed advice at the key stages (Consultation Report, Action Plan and Annual Review). The North Somerset Rivers Steering Group has 13 external members (see Section 26 for a list of members).

2.3.2 The Consultation Report

This Local Environment Agency Plan Consultation Report gives you the opportunity to comment on environmental problems or our work. It describes the environmental resources of the area, explains

how these resources are affected by human uses or pressures, and outlines issues where we or others need to take action to address problems in the environment.

2.3.3 The Action Plan

We will collate responses to this Report and publish an Action Plan in late summer 1998. Each year we will review the progress that has been made with the actions identified in the Action Plan and publish a brief review. Within five years of publishing the Action Plan we will carry out a major review of the progress we have made.

2.3.4 Local Environment Agency Plans and Development Plans

While we can control some of the things that influence the quality of the environment, we have only limited control over the way that land is developed. This is the responsibility of local planning authorities. Local authorities prepare statutory development plans; the policies in these plans will guide the way that land is developed in the future. We advise and guide local planning authorities to adopt policies that protect the environment from harmful development.

2.3.5 Indicative LEAP publication programme

North Wessex Area plan to publish LEAPs for the following areas to complete the coverage of the Area by the end of the millennium:

West Somerset Rivers	Spring 1998
Bristol Avon	Summer 1998
Parrett and Tone	Late autumn 1999

2.4 The LEAP Area

This LEAP Plan Area starts at Brean Down in the south and extends east to just beyond Blagdon Lake and then north to the mouth of the Avon.

The greater part of the population of 178,000 (1991 census) is concentrated in the coastal towns of Weston-super-Mare (64,935), Clevedon (21,670) and Portishead (14,721). Inland, the larger settlements are Nailsea (17,230), Yatton (6,826) and Congresbury (3,435).

The Plan Area combines the catchment of the Rivers Banwell, Oldbridge, Yeo, Kenn, Blind Yeo and Land Yeo, as well as the Uphill Great Rhine, the Drove Rhine and the Portbury Ditch.

Approximately one third of the Plan Area is potentially floodable, relying on engineered defences for flood alleviation (see Map 21). Nearly half the Plan Area is low-lying levels and moors where water is managed by three Internal Drainage Boards (see Map 22), the Gordano Valley, North Somerset and West Mendip Internal Drainage Boards.

The North Somerset Levels and Moors support some nationally important areas of high nature conservation value including one National Nature Reserve - Gordano Valley, and twenty-six Sites of Special Scientific Interest (SSSIs). (See Section 10.1).

The majority of the catchment is agricultural land - predominantly cattle farming. Tourism is particularly important in the area and is concentrated in the seaside resorts of Weston-super-Mare, Clevedon and Portishead. North Somerset Council are hoping to developing inland tourism including increased provision for walking and cycling.

The rivers in the Plan Area are characterized by having short upland reaches and long lowland reaches with very low gradients. The lower reaches are penned (see Issue 4.5) to maintain certain levels for agricultural benefit often resulting in water quality problems.

We monitor 75 km of rivers for chemical and biological quality in the North Somerset Rivers Catchment. In 1995, 21.6% of monitored river lengths in the catchment were of good or very good chemical quality, 15.5% were fairly good while 62.9% were either fair or poor. In biological terms 71.6% of the monitored river lengths were of good or very good quality while the remaining 28.4% were fairly good. Between 1990 and 1995 there was an overall deterioration in chemical quality over 36% of the monitored network. The chemical classification includes dissolved oxygen criteria which many North Somerset River stretches have difficulty meeting due to their penned and managed nature. This situation was made worse in 1995 by drought conditions. However, between 1990 and 1995 biological quality improved by 2%. Shortfalls in quality are described in this Consultation Report.

3. Protection Through Partnership

The Agency works in partnership with many organizations and individuals concerned with the protection and enhancement of the environment. In the UK as a whole much has been achieved already but much more is possible by working closely with others. The Agency is essentially a regulatory body and does not give grants, so to achieve some of its aims it must co-operate with others such as the local authorities and MAFF to harness their financial resources and technical expertise. The Agency can also work towards its objectives by working with voluntary groups such as the local wildlife trusts, and recreation associations. In some cases partnerships are already well established with other statutory bodies, especially where there is joint responsibility, such as the Internal Drainage Boards.

This section outlines some of these partnerships and indicates opportunities for further development.

3.1 Links with Local Authorities

We advise and work with the local planning authorities on the impact of proposed development together with our requirements for environmental protection (see Section 18). We also work with the local planning authorities to ensure that suitable policies to protect and enhance the environment are incorporated within Local Development Plans.

3.1.1 Air quality

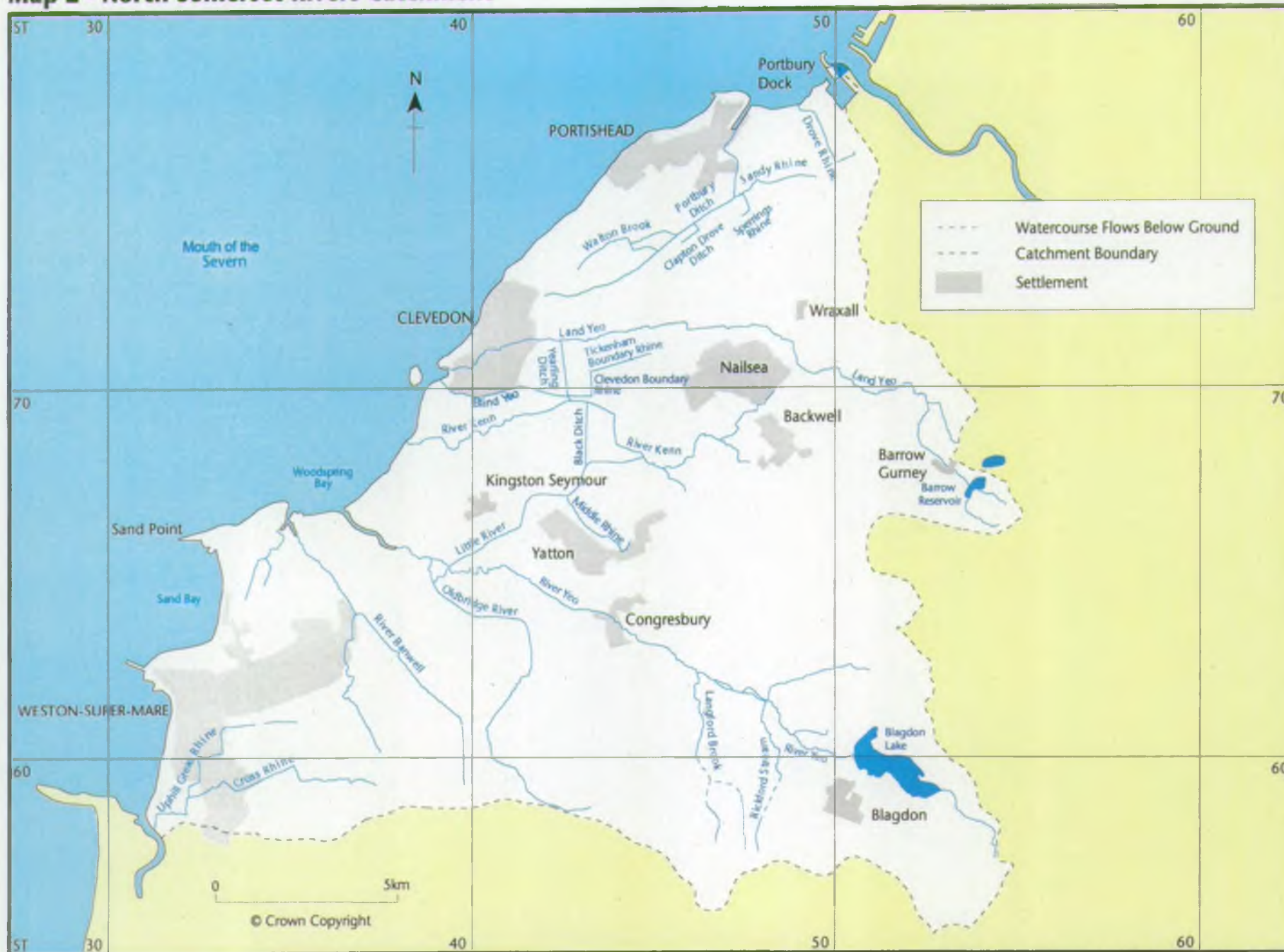
The Agency and local authorities are both responsible for aspects of air quality monitoring and management although local authorities are responsible for producing and implementing Local Air Quality Management Plans. We will work in partnership with local authorities to develop and implement Local Air Quality Management Plans.

3.1.2 Amenity and recreation initiatives

We have a duty to promote the recreational use of water and land. Local authorities often own the riverside land in towns and we work with them on schemes to enhance a town centre river corridor with, for example, landscaping, walkways and riverside seating. We continue to welcome approaches from local authorities and community groups to work collaboratively on such projects.

As part of such schemes nature conservation can be furthered by incorporating areas suitable for wildlife habitat.

Map 2 - North Somerset Rivers Catchment



North Somerset Rivers Local Environment Agency Plan

3.1.3 Local Agenda 21

Across the catchment, all local authorities are assisting their local communities in developing local strategies and action plans for sustainable development. The approach adopted varies from district to district, with many Local Agenda 21 groups setting up working groups looking at specific issues. We are currently looking at how we can be most effective in assisting local communities in developing their Local Agenda 21 plans.

3.1.4 Shoreline Management Plans (SMPs)

SMPs are being produced by a range of groups with statutory interests working together. Shoreline Management Plans provide an integrated review of coastal processes and develop sustainable coastal defence policies to set objectives for the future management of the shoreline. The Severn Estuary SMP includes the coast within this LEAP.

3.2 Water Level Management Plans

Within the catchment the Agency, together with North Somerset Internal Drainage Board (IDB), West Mendip IDB and Gordano Valley IDB all have an interest in the production of Water Level Management Plans. This initiative, promoted by MAFF and involving detailed discussions between the Agency, IDBs English Nature and landowners, will seek to balance the interests of conservation with other water level dependant interests through appropriate water level management. We have identified those river stretches where water levels critically affect the ecology (see Map 14).

3.3 Working with Businesses

We are working in partnership with local businesses to promote pollution prevention and waste minimization. Examples include:

- our "3 E's" campaign (Emissions, Economics, Efficiency) which aims to reduce waste, packaging, effluent and energy use and thereby both help the environment and save businesses money
- farm waste management plans developed with farmers and ADAS
- our oil care campaign
- our training video for construction workers.

We work with the Farming and Wildlife Advisory Group (FWAG) to promote environmentally friendly farming practices.

3.4 Links with Government Bodies

3.4.1 Conservation

We are engaged in a jointly funded project with English Nature (EN), North Somerset Council and The Wildlife Trust (Avon) on the North Somerset Levels and Moors.

3.4.2 Education

We recognize that broad-based education covering the community, educational and industrial sectors will result in a more informed society that is better able to understand the environment, its needs, and the impact of society's activities upon it. In particular, there is a need to:

- educate young people to equip them to make informed judgements about future environmental decisions
- educate industry through consultation, collaborative activities and targeted campaigns to promote a culture of prevention rather than cure
- raise public awareness of environmental issues to engender in society a common ownership of the environment and its challenges.

Currently, we provide a wide range of information to all sectors of society, and in addition give many talks and presentations. The Agency has recently published a leaflet entitled 'Green Shoots our Vision for Environmental Education'.

Each LEAP is guided by a Steering Group whose members are drawn from our key customers and include: English Nature, Country Landowners Association, National Farmers Union, Internal Drainage Boards, Local Authorities, Industry, Waste Management Companies, Wildlife Trusts, Fisheries Interest, British Canoe Union and Water Companies.

We are working in partnership with the public to identify pollution incidents through our Pollution Hotline 0800 80 70 60.

3.5 Examples of Partnerships

Species survey work with the Wildlife Trust (Avon), Bristol Regional Environmental Records Centre (BRERC) and the Hawk and Owl Trust.

Through the North Somerset Levels and Moors Project we are jointly funding initiatives such as otter habitat improvement, water-vole surveys, breeding wader counts and dragonfly and damselfly monitoring.

The Agency is supportive and an active partner in the North Somerset Countryside Strategy (1995) and in the North Somerset Coastal Group which looks at opportunities for managed retreat along the coastline of North Somerset.

4. Issues and Options

The issues discussed here are only those that the Agency perceives to be problems within the Plan Area. There may be others, or some may not in fact be problems. No priority of importance is implied by the order in which they are presented. We want to hear from you, the reader. Have we got our issues list right?

The options for action are our suggestions for consultation. No priority is implied by position in the tables and no commitment is being made to carry them out at this stage, because this is a consultation document and other options may arise from the consultation process. Actions will be decided upon following the consultation period which ends 31 March 1998 and will be published in the North Somerset Rivers LEAP Action Plan due to be published in autumn 1998.

4.1 Issue - Development Pressure

4.1.1 Background

The Agency is concerned that planned development within the catchment which includes the building of approximately 10,450 new houses between 1989 and 2001 and the creation of 175 ha of employment land (see Section 18) might have a detrimental impact on the environment. The Agency is committed to working towards sustainable development (see Section 2.1.2) and will use its regulatory powers and give appropriate advice to minimize the environmental impact of this development.

A major challenge posed by such development is to maintain and where appropriate enhance the exceptional biodiversity and wildlife interest of the catchment whilst still maintaining a healthy local economy. (See Issue 4.3).

Likely effects of development pressure are:

- an increase in the quantity of raw sewage requiring treatment which might lead to greater pollution load on watercourses (see Section 20)
- an increased demand for water for public supply, industry and agriculture (see Section 19)
- an increase in the quantity of waste requiring disposal (see Section 15)
- an increase in housing and infrastructure which will use up green field sites and change drainage regimes (see Section 17)
- an expansion of industry could lead to an increase in polluting discharges to both water and air, and lead to increased industrial waste production (see Sections 8, 15, 16 and 20).
- Tidal or fluvial flood defences may require improving to the appropriate urban standard (see Section 17.4) when development is proposed or planned for the area protected by them in order to give acceptable alleviation from flooding to people and property. Examples are listed below.
 - The River Banwell is a tide-locked watercourse which means that river levels are below high tide sea level. At high tide gates are closed to prevent the sea entering the watercourse which prevents the river draining to the sea for several hours in each tidal cycle. Also it only has agricultural standard river defences. Development is proposed to the east of Weston-super-Mare at Locking Castle requiring upgrading of the defences to a 1 in 100 year flood standard.
 - The area of Portbury Dock to the east of Portishead is identified as an 'Action Area' within the North Somerset Local Plan. The action area is identified for residential/retail and employment use and covers an area of 185 ha. The majority of the area is subject to tidal flood risk.

The existing tidal defence is owned by the Portbury Sea Wall Commissioners. It is constructed to an agricultural standard only, and considered sub-standard by the Agency. As part of the Action Area infrastructure requirements, the Agency has negotiated a new tidal protection wall/bank for Portishead and the Action Area which will give tidal protection to the 1:200 year event. As the defences are classified as 'strategic', the Agency has agreed to take over the future maintenance of the defences subject to the provision of a commuted sum. The Agency has requested further details of the bank and its environment.

There is a need to link the management of coastal defences to the area that they protect by means of suitable policies in the North Somerset District Plan (see Section 18). Areas should be zoned appropriately.

There is also a need to ensure that developers provide new drainage in a fully integrated way to avoid previous problems of inadequate outfalls for example at Locking Castle where as a result of plan allocation in the 1980s huge swathes of land are available for development on the north-eastern side of Weston-super-Mare. This area is generally known as Locking Castle. Development in this area has been allowed to commence with around 300 houses being completed. Unfortunately the appropriate infrastructure to accompany the development was never completed. As this land is flat it required the introduction of a drainage system incorporating four balancing ponds and a number of pumping stations to move surface water into them. To date these pumping stations have not been built. This leaves the area at risk from flooding not only from the nearby River Banwell, but also from the inadequate drainage infrastructure in place.

Funding to provide the necessary infrastructure will need to be urgently addressed as costs are likely to run to several million pounds. A strategic approach to the design of the infrastructure is urgently required. The Environment Agency and officers of the North Somerset Council have now agreed a joint approach is necessary to identify both the works required and the means of funding them. Works will be required to both the drainage infrastructure and the River Banwell in order to resolve the issue.

Options for action	Responsibility
Produce a strategic plan for the infrastructure for the drainage of the Locking Castle developments into the River Banwell	Agency, North Somerset Council
Negotiate appropriate tidal defence provision and adopt for maintenance when acceptable, in the Portishead Action Area	Agency, Developer
Negotiate the provision of a strategic surface water disposal system for the Portishead Action Area	Agency, Local Planning Authority (LPA), Developer
Negotiate with interested parties an integrated strategy for linking land use and coastal defence for the North Somerset coast	Agency, North Somerset Council, Internal Drainage Boards (IDBs), English Nature (EN), North Somerset Levels & Moors Project
Negotiate with interested parties an integrated approach to developers on drainage issues in the North Somerset Council Area	Agency, Water Companies, IDBs, North Somerset Council
Work in partnership with North Somerset Council to improve their environmental protection policies and work towards a more sustainable type of development	North Somerset Council, Agency
Enforce discharge consents and IPC authorizations, and where necessary review	Agency
Work with Wessex Water Services Ltd (WWSL) to prioritize their expenditure at STWs	Agency, WWSL
Work with water supply companies to prioritize expenditure on water resource management and development	Agency, Bristol Water, WWSL

Options for action	Responsibility
Survey waste arisings in the catchment area to provide a basis for waste planning	Agency
Advise waste disposal authorities and local industry on the best practice for waste minimization and disposal. Enforce the new Producer Packaging Regulations	Agency, Industry
Seek the earliest possible discussions with new developers and the local planning authorities to advise on the best environmental options for proposed developments, including flood alleviation measures	LPA, Agency, Developers

4.2 Issue - Inadequate Flood Defences

4.2.1 Background

The Agency is responsible for providing appropriate flood alleviation for people and property. Different types of property and land need different levels of protection (See Section 17.4)

The tidal defences for Weston-super-Mare and Clevedon have been overtopped in the floods of October 1996. These defences are owned by North Somerset Council who are the Coast Protection Authority here and most recently offer a lower standard of flood alleviation than the rest of the Somerset coast. For more detail of coastal defence see Severn Estuary Joint Issues Document.

The fluvial defences around Congresbury are only to the standard for agricultural land use. This is a factor that we would expect North Somerset Council to take into account when considering land allocations for housing development as part of their Strategic Planning process, as we would require any developers to pay for improving defences to the urban standard.

Options for action	Responsibility
The Agency will encourage the promotion of schemes and in conjunction with others consider options for funding. Note: Shoreline Management Plans are reviewing coastal defence options (see Section 17.5)	Agency, Ministry of Agriculture, Fisheries and Food, North Somerset Council
Advise North Somerset Council strategic planners on flood defence matters e.g. fluvial defences at Congresbury, for their input to Strategic and Local Plans	Agency

4.3 Issue - Maintaining and Enhancing Biodiversity

4.3.1 Background

Biodiversity means the variety of life on earth. Human activities have caused an increasing decline in biodiversity. The Agency is working in partnership with others to halt this decline and where possible enhance biodiversity. The Agency's largest contribution towards increased biodiversity is being achieved by our general work to improve water quality, quantity and improved river and wetland habitats. In addition specific actions are proposed for those species and habitats for which we are committed to support biodiversity initiatives. For more detail see Section 10.3.

Options for action	Responsibility
Work with North Somerset Council on their forthcoming BAP	Agency, North Somerset Council
Continue to support the North Somerset Levels and Moors Project	Agency
Rhines and ditches (and associated species of plants and invertebrates) - work closely with partners in the North Somerset Levels & Moors Project to promote appropriate water quality and biological conditions across the area	Agency, English Nature (EN), North Somerset Levels & Moors Project (NSL&MP), FWAG
Reedbeds - assist in habitat creation schemes	Agency, NSL&MP
Fen meadows and raised mire communities - continue national programme to reduce emissions of sulphur and nitrogen oxides from major power plant. Continue to support monitoring of species communities with partner organizations, and formulate action plan	Agency, National Power, EN, Avon Wildlife Trust (AWT)

Options for action	Responsibility
Lowland wet grassland - participate in the production of Water Level Management Plans	IDBs, Landowners, Agency, NSL&MP
Tufa depositing springs and headwater streams - survey to assess value and develop conservation strategy	Agency, Bristol Regional Environmental Records Centre (BRERC), AWT
Water-voles - increase our knowledge of distribution and investigate the main reasons for the absence of water-voles from large areas of the catchment	Agency, NSL&MP
Otters - assist with the monitoring of otter populations, establish otter corridor links to adjacent catchments through habitat creation, establish water quality objectives necessary to maintain otter populations, analyse tissue of road casualties	Agency, NSL&MP
Native crayfish - continue to support survey work to enable the formulation of a conservation strategy	Agency
Eels - implement recommendations of Barriers to Migration survey (see Section 12)	Agency
Barn owls - provide and monitor nest boxes and manage habitat to encourage voles on Agency owned land	Agency, Hawk & Owl Trust
Invasive plants - continue to assess the overall problem. Control any causing an obstruction to flood flow and take measures to prevent spread from our own land	Agency

4.4 Issue - The Decline in Water Quality

4.4.1 Background

Section 2.4 gives an overall picture of water quality and trends in water quality in this catchment. For more details see our publication "The Quality of Rivers and Canals in England and Wales 1995". Our monitoring showed a deterioration of quality in 35% of the monitored network occurred between 1991 and 1995. This was largely due to failure of the dissolved oxygen standard which we believe is due to the penned nature of the lower reaches of these watercourses, made worse in 1995 by drought conditions.

We hope to maintain and where possible enhance water quality by means of River Quality Objectives (RQOs), see Section 6. However our objectives have to be realistic and achievable and so we have proposed RQOs of RE4 and in one case RE5, again mainly because of the problem with dissolved oxygen. However, RE5 "poor quality" is the lowest objective and our catchment Steering Group have recommended upgrading this to RE4.

The attainment of higher quality standards may not be possible but could only be achieved following a full review of all factors affecting quality on these stretches.

Options for action	Responsibility
Upgrade RQO for the stretch: River Land Yeo - Clevedon to sea, from RE5 to RE4	Agency
A full review of all factors affecting water quality on those stretches with RE4 and RE5 as proposed objectives	Agency, Internal Drainage Boards

4.5 Issue - The Impact of River Regulation, Penning and Nutrient Enrichment

4.5.1 Background

Many of the watercourses in the catchment have significant abstraction from their headwaters for water supply. Except at times of very heavy rainfall, flows are restricted to relatively low "compensation" flows required by the abstraction licence. In many catchments water taken out for public supply is returned as treated sewage effluent and augments flows further downstream. However, in this catchment most of the sewage effluent is discharged directly into the Severn Estuary thus depriving the rivers of this contributory flow. Penning (holding back river levels artificially high using structures such as fixed weirs or adjustable sluices) is traditionally carried out to benefit

agriculture but can further reduce these flows. This leads to lack of aeration and subsequent low dissolved oxygen levels.

Where plant nutrient levels build up in watercourses excessive growth of plants can occur, known as eutrophication. Often one particular species dominates, such as one of the pond weeds or filamentous algae leading to blanket cover of the whole watercourse. Where in addition to nutrient build up, penning reduces flows to very low levels, blooms of planktonic algae can result.

4.5.2 Effects

- Where the rivers are penned, for example to provide local irrigation, the water can become dominated by excessive weed growth. This in turn can prevent light penetration and deoxygenation may follow with a consequent serious harmful impact on wildlife. There is a problem on the lower reaches of the River Yeo (Congresbury) and the River Banwell where we suspect it is limiting fish populations.
- Reducing flows can lead to deposition of the river's bed load of silt. This may smother fish eggs and other aquatic life. Part of the Blind Yeo has silted up 20 cm in the past 2 years.
- Contributes to non-compliance with River Quality Objectives (RQOs) (see Section 6.2) on the following stretches (1996):

River	Stretch	Stretch Reference	River Quality Objectives	Parameters Causing Non-compliance	Reasons for Non-compliance
Banwell	Banwell - M5	1	RE4	Dissolved Oxygen (Marginal)	This is a penned watercourse, resulting in low flows, lack of aeration and algal growth in the summer
Banwell	M5 - St Georges - Sea	2	RE4	Dissolved Oxygen (Significant)	As above
River Yeo	M5 - Icelton	7	RE2	Dissolved Oxygen (Marginal)	As above
Portbury Ditch	Source - Middle Bridge	13	RE4	Dissolved Oxygen (Significant)	As above
Portbury Ditch	Middle Bridge - Sea	14	RE4	Dissolved Oxygen (Significant)	As above

- Contributing to non-compliance with EC Fisheries Directive (see Section 6.4) cyprinid imperative standards for dissolved oxygen (1993-1995) on the following stretches:

River	Stretch
River Banwell	Confluence to Towerhead Brook
Portbury Ditch	Walton to A369 road bridge

Options for action	Responsibility
Review control of penning structures	Agency
Avoid water losses by efficient use of the irrigation network on the levels and moors	Agency, IDBs
Address acute water quality problems by short term measures such as aeration to increase dissolved oxygen levels	Agency
Establish the frequency of algal blooms, the extent of eutrophic effects and the source of excess nutrients	Agency

Options for action	Responsibility
Review control of penning structures	Agency
Work with others to reduce nutrient levels by controlling point sources, and diffuse agricultural pollution (see Issue 4.8)	Agency, farmers, Ministry of Agriculture, Fisheries and Food (MAFF)
Promote the creation of buffer strips to take up excess fertilizer runoff	Agency, MAFF
Control spreading of waste to land to prevent runoff to rivers	Agency, farmers, MAFF
Draw up memoranda of understanding with other users such as Internal Drainage Boards (IDBs), water companies and conservation bodies to secure wise use of resources	Agency, IDBs, English Nature (EN), Royal Society for the Protection of Birds (RSPB), North Somerset Levels & Moors Project (NSL&MP)
Carry out R&D to investigate the effect of river control structures on fisheries	Agency
Improve understanding and control of the drainage system to ensure best use of the available resources and, where appropriate minimize the diversion of water from the principal rivers and drains during dry weather. Note: This may be achieved by Water Level Management Plans (WLMPs)	Agency, IDBs, EN, NSL&MP
Consider the provision of additional storage volume to provide more irrigation water	Agency
Identify opportunities for increasing the depth of winter water level	Agency, IDBs, EN, NSL&MP

4.6 Issue - The Impact of River Maintenance

4.6.1 Background

Some of the rivers in the catchment have been highly modified to reduce or control flooding. For example, some rivers like the River Banwell have been canalised, others like the River Yeo are heavily embanked, and some like the Lower River Kenn and Land Yeo now have part of their natural flow diverted into other watercourses (see Map 15).

Re-engineering channels to improve their wildlife and environmental value is costly and is only justifiable if major investment is needed to improve floodbanks or other flood defence structures. We are prioritizing river restoration schemes for the future. These may be the subject of partnerships with local authorities in order to fund and to take forward projects.

Present standards of flood protection can only be sustained by intensive maintenance of the channels and banks including dredging, weedcutting and tree/scrub clearance. This maintenance regime can bring environmental problems affecting water quality and river habitats.

The current review of flood defence maintenance should reveal if present practice is both justified and sustainable in both financial and environmental terms. An overall review and statement of the justification of these practices is needed.

4.6.2 Effects

- Dredging and weedcutting often degrade river habitats and limit their landscape value.
- Weedcutting often stirs up sediment causing oxygen depletion and distress to fish; occasionally we need to take action to aerate the water.
- Lack of habitat diversity where channels have in the past been straightened for improved drainage.

- Contributes to non-compliance (1993-1995) with the EC Fisheries Directive (see Section 6.4), cyprinid imperative standards for Dissolved Oxygen on the Portbury Ditch, Walton-in-Gordano - A369 road bridge.
- May contribute to reduced biological quality (see Section 6.12) (class "c") on the River Yeo in Congresbury and the Land Yeo in Clevedon.

Specific examples of problem areas are listed below:

- A one kilometre stretch of the River Kenn downstream of Kenn Pier is nearly dry and overgrown because water is diverted into the Blind Yeo.
- The Land Yeo through Clevedon has vertical banks; culverts and bankside buildings making maintenance very difficult. In consequence the channel is unattractive and is used as a fly tipping site.
- Development along the Uphill Great Rhine in Weston-super-Mare has turned its back on the watercourse and so the rhine is held in low regard. In consequence it is used for fly tipping and debris accumulating on the outfall screen constitutes a serious flood risk. In addition there is pressure to culvert some stretches.
- A one kilometre stretch of the Langford Brook that was straightened some years ago by the riparian owner (see Section 10.7).

Options for action	Responsibility
Review flood defence maintenance and develop Flood Defence Management System	Agency
Survey assets 1997. Classify upland river reaches in accordance with the SoS (see Section 17.4)	Agency
Review the Somerset Levels & Moors Strategy to possibly include the North Somerset Levels and the Gordano Valley	Agency
The current state target standards of flood protection will be compared to and differences addressed in 1998 (see Section 17.4)	Agency
Seek resources to re-engineer channels and floodbanks to provide a more natural shape as need or opportunity arises (see Section 10.7)	Agency, Riparian Owners
Examine current weed removal practices to reduce risk of fish kills, and provide benefits for wildlife conservation	Agency
Explore tree planting opportunities to provide shade and reduce the need for aquatic weed cutting as appropriate sites are identified (i.e. sites where maintenance access is not blocked and with the riparian owners agreement)	Agency, Farming and Wildlife Advisory Group (FWAG), Landowners, North Somerset Levels & Moors Project (NSL&MP)
Establish a study group with parties to investigate options for water level management and the funding of changed arrangements for the River Kenn downstream of Kenn Pier (see Issue 4.4)	Agency, North Somerset Council, Internal Drainage Boards (IDBs), Wildlife Trust
With interested parties establish an Action Group to plan actions and their implementation including funding for the Land Yeo in Clevedon and the Uphill Great Rhine	Agency, North Somerset Council, Clevedon Town Council, other interested parties
Investigate the impact of weedcutting and other maintenance work on biological quality on the River Yeo and water quality on the Portbury Ditch and draw up an improved maintenance strategy	Agency

4.7 Issue - The Impact of Landfill Activities on Cold Bath Spring Public Water Supply Source

4.7.1 Background

The Cold Bath Spring public water supply source at Barrow Gurney has been identified by Bristol Water as being unusable during low flow conditions when the concentration of ammonia present in the spring renders it unfit for supply. The catchment for the spring is designated as a Source Protection Area (see Map 9) but has 2 large landfills within it, which were established before the NRA started implementing its Groundwater Protection Policy. One landfill, Dial, is no longer used. The other, Hartcliffe, is still operational (see Map 20).

There are currently no groundwater monitoring boreholes around the Dial site.

4.7.2 Effects

- Boreholes around Hartcliffe Landfill indicate that groundwater is contaminated by leachate containing high levels of ammonia.
- The Cold Bath Spring source is not useable at this time with no indication of a likely date for it to be reusable.

Option for action	Responsibility
Continue to monitor groundwater in all boreholes around Hartcliffe Landfill and monitor the Cold Bath Spring public water supply source	Agency/Hartcliffe Landfill site operators/Bristol Water
Investigate whether or not Dial Landfill has an impact on the quality of Cold Bath Spring	Agency
Investigate any other possible sources of contamination including the supply conduit between Chew Valley and Barrow Gurney	Agency
Use the information from the monitoring to draw up a remedial plan for the source	Agency

4.8 Issue - The Impact of Agricultural Discharges and Runoff

4.8.1 Background

Both diffuse pollution from fertilizer and pesticide runoff and direct consented and unconsented farm discharges (e.g. slurry, silage, yard and parlour washings) can cause problems of degraded water quality both in surface and groundwater. Reports have been received and investigated of episodic farm discharges to the Land Yeo. These are usually related to periods of heavy rainfall. Currently, most farmers are reviewing their inputs and as a result are reducing fertilizer use to cut costs. Note that sewage treatment works also contribute to the nitrate and ammonia load in watercourses.

4.8.2 Effects

- Fertilizer runoff contributes to nutrient enrichment and eutrophication. (See Issue 4.4 and Section 6.11).
- Contributes to non-compliance with EC Fisheries Directive Cyprinid imperative standard for total ammonia (see Section 6.4) on the River Banwell.
- Causes poor water quality in the Land Yeo.

Options for action	Responsibility
Install automatic monitors on the Land Yeo downstream of suspected discharges	Agency
Revisit all suspected farms to ensure that farm waste management is effective	Agency
Take enforcement action against farms who discharge illegally	Agency
Promote good agricultural practice with other bodies	Agency, FWAG, MAFF

4.9 Issue - The Impact of Mushroom Farming

4.9.1 Background

Monaghan Middlebrook Mushrooms is one of the largest mushroom producing complexes in Europe. The main canning factory on site is served by a consented treatment plant which discharges to a tributary of the Langford Brook.

Problems have occurred associated with the extensive yard areas upon which the mushroom compost is made. This process requires considerable amounts of water which is sprayed over the compost and recirculated to holding tanks. The water balance is difficult to manage and periods of heavy rainfall can result in an overflow of "goody" water (composting water) strongly contaminated with ammonia to a tributary of the Langford Brook. Since early 1996 we have not experienced these problems as a result of the installation of new holding tanks. However, Monaghan now wish to expand from the existing 90 sheds.

Monaghan assure us that the surface area of the compost yard will not increase and therefore that the volume of "goody water" should not increase and may even decrease.

Monaghan have been in consultation with ourselves and have proposed further measures to reduce the quantity of contaminated water produced and to increase storage, consequently we do not anticipate the scale of problems previously encountered. However, should an exceptionally heavy rainstorm occur these measures may not be adequate.

4.9.2 Effects

- The holding lagoon can overflow in heavy rain discharging a highly polluted effluent. Ammonia has been detected in the Langford Brook for considerable distances downstream of the mushroom farm.

Options for action	Responsibility
Ongoing negotiations to ensure that storage volumes match the volume of effluent produced	Agency/Monaghan
Monitor the discharge and Langford Brook to check the effectiveness of the new arrangements	Agency

4.10 Issue - The Impact of the Unconsented Discharge from the Water Treatment Works at Barrow Reservoirs

4.10.1 Background

Since 1995 the Agency has been negotiating with Bristol Water over the need for a consent to discharge (see Section 20) for a sand filter wash water effluent to a tributary of the Land Yeo. The Agency have been led to understand that all discharges are being recycled. Complaints from riparian owners downstream about discoloration and sedimentation have not been substantiated by our random sampling in the watercourse.

4.10.2 Effects

- Possible impacts on the watercourse could include elevated ammonia, suspended solids and iron levels with associated deposition of material downstream unless regulated by a tight Consent to Discharge.

Options for action	Responsibility
Continue discussions with Bristol Water to decide which of the two options should be pursued: i) determine a Consent to Discharge ii) recycling i.e. no discharge	Agency, Bristol Water
Continue monitoring downstream to ensure that an unconsented discharge is not occurring	Agency

4.11 Issue - The Impact of the Lack of Compensation Flow from Barrow Reservoirs

4.11.1 Background

All the flows of the Dundry and Elwell Springs go into Barrow Reservoirs which contribute to Bristol's public water supply. There is no compensation flow downstream of Barrow Reservoirs as the authority for the impoundment was secured under an Act of Parliament which did not require this condition. The watercourse is dry as far as its first tributary, a distance of 2.5 km.

4.11.2 Effect

- The lack of compensation flow causes complaints of lack of flow and water quality and fisheries issues further downstream.

Options for action	Responsibility
Monitor the effects of the lack of flow and enter into discussions with Bristol Water with a view to examining the feasibility of securing a flow downstream of Barrow Reservoir	Agency
Investigate impacts on water quality, river ecology and fisheries and produce a report	Agency

4.12 Issue - Use of Environment Agency Owned Land

4.12.1 Background

We own significant areas of riverside land within the catchment, principally along the Blind Yeo. We will work to maximize the nature conservation value of this land, and to promote appropriate recreation activities through conservation and recreation management plans.

The Blind Yeo in particular has great potential. As part of our implementation of the management plan we are enhancing habitats by creating bankside reedbeds and altering grass land management regimes. We also have been liaising closely with North Somerset Council regarding the use of the Blind Yeo's river banks as public open space.

North Somerset Council's Countryside Strategy (see Section 9) has highlighted areas where improved access would be a public benefit. Increased provision for walkers and cyclists will be considered in relation to land we own, but possible damage to flood banks is a problem for cycle routes.

Also, any proposed use of Agency owned land will have to take into account health and safety aspects. Currently there are no health related standards for water quality to protect the use of rivers for immersion sports. Safety equipment by rivers, such as lifebuoys is notoriously difficult to keep in operational condition due to vandalism.

Canoeists only regularly canoe 2 stretches within the catchment but would welcome access to other rivers if they could negotiate an agreement to use the watercourse. The Agency may be able to provide access to the river over its own land.

Options for action	Responsibility
Complete our Blind Yeo conservation and recreation management plan	Agency
Help to develop riparian footpaths particularly in and around towns, and cycling routes where appropriate, in partnership with others	North Somerset Council, Riparian owners, Agency
Develop better access to watercourses where the Agency owns the land	Agency, British Canoe Union

Part 2

5. The Physical Environment

5.1 Geology

The North Somerset Rivers Catchment is one of geological contrasts, with rocks ranging from the Devonian to the Jurassic Periods together with recent alluvial sands, gravels and silts, and an isolated deposit of glacial sands and gravels (see Map 3). The oldest rocks that reach the surface are the Old Red Sandstones which underly the Carboniferous Limestones and limestone shales. In this catchment, the main outcrops of this rock type are found bordering the Walton Brook to the north west of the Clevedon-Failand Ridge. The Carboniferous Limestones of this ridge, together with those of Broadfield Down and the most northerly section of the Central Mendips, have been extensively folded and faulted. Two other small limestone outcrops form the northern and southern arms of Sand Bay near Weston-super-Mare. The Carboniferous is further represented by the Pennant Measures and Lower Coal Series which outcrop between Broadfield Down and the Clevedon-Failand Ridge. Overlying and surrounding the Carboniferous rocks are the mainly red Permian and Triassic sandstones, conglomerates and mudstones. Small exposures of Lower Liassic clays are also found. The rest of the catchment is made up almost entirely of flat, low-lying estuarine alluvium.

5.2 Hydrology

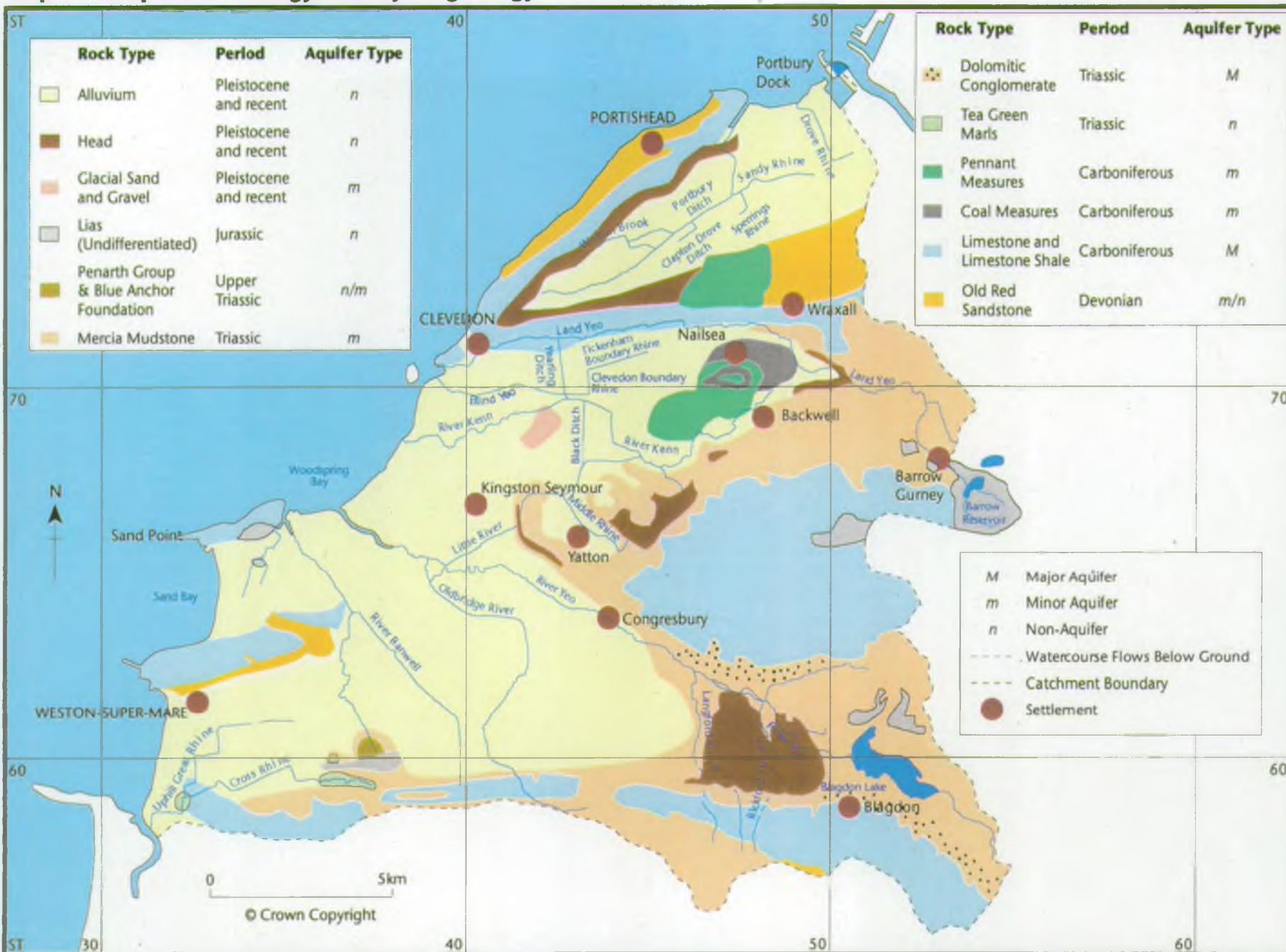
The distribution of rainfall over the catchment together with our network of rainfall, river flow and groundwater level monitoring stations is shown on Map 4. The range of rainfall varies from 800 mm at Weston-super-Mare to around 980 mm to the east of Blagdon Lake. We estimate the catchment long term average rainfall (1961-90) to be 855 mm per year.

The Mendip Hills, in the west of the catchment, consisting of fissured limestone, cause the River Yeo, River Banwell and Oldbridge River to respond rapidly to rainfall. This stretch is regulated by a compensation flow from Blagdon Lake with all major springs on the Mendips being captured by Bristol Water for public water supply. Baseflows are maintained throughout the summer months by minor springs issuing from the Mendips and by compensation flows provided by Bristol Water. The remaining river network draining the north of the catchment does not respond rapidly to rainfall and rivers are characterized by low baseflows.

5.3 Hydrogeology

Of the varying rock types within the catchment, only the Carboniferous Limestone has been classified as a major aquifer. Minor aquifers of local importance include the glacial sands and gravels, the Triassic Dolomitic Conglomerate, the Penarth and Mercia Mudstone Groups, the Pennant Sandstones and the Coal Measures. The Lower Liassic clay is considered to be a non-aquifer. There are several public water supplies from groundwater sources in the catchment: Banwell Spring, Chelvey Well, Cold Bath Spring and Clevedon Well and Borehole. The main source of water for all of these supplies is the Carboniferous Limestone. In addition, there are many smaller springs. Some of these issue from the Dolomitic Conglomerate but their main source is the Carboniferous Limestone.

Map 3 - Simplified Geology and Hydrogeology



6. Water Quality

6.1 Our Proposed Targets for River Water Quality

We manage surface water quality by setting targets called River Quality Objectives (RQOs). They are intended to protect current water quality and future use, and we use them as a basis for setting consents for new discharges and planning future water quality improvements. We also manage water quality by applying standards set in EC Directives and other international commitments.

Failures to comply with these standards are dealt with in Sections 6.2 to 6.10 and Map 6. Options for action to achieve compliance are described in that issue covering the impact which is causing the non-compliance see Issue 4.8.

We have proposed our RQOs using a classification scheme known as River Ecosystem (RE) which was introduced by the National Rivers Authority (NRA), following public consultation, in 1994. It replaces a former scheme introduced by the Water Authorities in the late 1970s and used by the NRA until 1994. The RE classification comprises five hierarchical classes as summarized below.

RQO (RE Class)	Class Description
RE1	Water of very good quality suitable for all fish species
RE2	Water of good quality suitable for all fish species
RE3	Water of fair quality suitable for high class coarse fish populations
RE4	Water of fair quality suitable for coarse fish populations
RE5	Water of poor quality which is likely to limit coarse fish populations

The RQOs we set must be achievable and sustainable; we must be able to identify what needs to be done to meet the RQO, and to ensure as far as practicable that water quality can be maintained at this level in the future.

Where we are unable to identify solutions or resources to resolve current water quality problems, we can also set a Long Term RQO. We will measure compliance against RQOs but use Long Term RQOs as a basis for setting consents for new discharges. This will ensure that future developments will not prevent us from achieving our long term objectives.

The rivers of the North Somerset Rivers Catchment have been divided into 14 classified reaches and the RQOs that we intend to set are outlined in the table below and shown on Map 5

River	Stretch Name	Stretch Ref No.	River Quality Objectives
Banwell	Banwell-M5	1	RE4
	M5-Sea	2	RE4
River Yeo	Blagdon Lake-Perry Bridge	3	RE3
	Perry Bridge-Wrington	4	RE2
	Wrington-Congresbury	5	RE2
	Congresbury-M5	6	RE3
	M5-Icelton (Estuary)	7	RE2
Kenn	Source-Sea	8	RE4
New Blind Yeo	Cut From Kenn-Clevedon	9	RE4
	Clevedon-Sea	10	RE4
Land Yeo	Source-Clevedon	11	RE2
	Clevedon-Sea	12	RE5
Portbury Ditch	Source-Middle Bridge	13	RE4
	Middle Bridge-Sea	14	RE4

We welcome your comments on the River Quality Objectives that we propose.

Map 5 - Proposed River Quality Objectives (River Ecosystem Classification 1996)



6.2 River Quality Objective Compliance

Map 6 shows where current water quality fails to meet its RQO see Section 6.1. This assessment is based on three years of routine monitoring data from the Public Register collected between 1994 and 1996. We have shown failures to meet RQO as *significant* and *marginal* failures. Significant failures are those where we are 95% certain that the river stretch has failed to meet its RQO. Marginal Failures are those where we are less certain (between 50% and 95%) that the stretch has failed to meet its RQO.

Of the 14 monitored river stretches (74.9 km) in the North Somerset Rivers Catchment there are 3 stretches (13.9 km) which significantly fail to meet their RQO, and 2 stretches (5.6 km of river) which marginally fail to meet their current RQO.

Table 1 Non-Compliant Stretches (1996 RE Class) in the North Somerset Rivers Catchment

River	Stretch	Stretch Reference	River Quality Objectives	Parameters Causing Non-compliance	Reasons for Non-compliance
Banwell	Banwell - M5	1	RE4	Dissolved Oxygen (Marginal)	This is a penned watercourse, resulting in low flows, lack of aeration and algal growth in the summer. See Issue 4.4
Banwell	M5 - St Georges - Sea	2	RE4	Dissolved Oxygen (Significant)	As above
River Yeo	M5 - Icelton	7	RE2	Dissolved Oxygen (Marginal)	As above
Portbury Ditch	Source - Middle Bridge	13	RE4	Dissolved Oxygen (Significant)	As above
Portbury Ditch	Middle Bridge - Sea	14	RE4	Dissolved Oxygen (Significant)	As above

Map 6 - Compliance with Proposed River Quality Objectives (River Ecosystem Classification 1996)



• SUPPORTING INFORMATION



6.3 EC Bathing Waters Directive

Coastal issues are covered in our Severn Estuary Plan. See Severn Estuary Strategy Joint Issues Report (published May 1997 by the Severn Estuary Strategy Project Group).

6.4 EC Freshwater Fish Directive

The EC Directive on *the quality of waters needing protection or improvement in order to support fish life* (78/659/EEC) ensures that water quality in designated stretches of water is suitable for supporting certain types of fish.

This Directive contains two sets of quality standards. One set of standards protects cyprinid or coarse fish populations for example roach and chub. The other set of standards that are stricter, protects salmonid or game fish populations for example, salmon and trout.

We are responsible for monitoring the quality of identified fisheries and reporting the results to DETR who decide whether the standards in the Directive have been met. Where the requirements of this Directive are not met, we are responsible for identifying sources of pollution and making sure that improvements are made.

Table 2 Compliance with Imperative Standards of the EC Freshwater Fish Directive 1993 - 1995 - Cyprinid

Watercourse	Stretch	Length km	Year of non-compliance and failing determinand	Reason for non-compliance
River Banwell	Confluence Towerhead Brook - Confluence Worle Stream	4.5	1993, Total Ammonia 1995, Dissolved Oxygen	See note 1 See note 2
River Yeo	Confluence Wrington Stream to Congresbury	10	Compliant	
Blind Yeo	Confluence River Kenn - Sea	4	Compliant	
Land Yeo	Tickenham - Yearling Ditch	7	Compliant	
Portbury Ditch	Walton in Gordano - A369 Road Bridge	6	1995, Dissolved Oxygen	See note 3
River Kenn	Chelvey - Sea	10.9	1993, Total Ammonia, Unionised Ammonia, Dissolved Oxygen 1994, Total Ammonia, Dissolved Oxygen	See note 4

Table 3 Compliance with Imperative Standards of the EC Freshwater Fish Directive 1993 - 1995 - Salmonid

Water	Stretch	Length km	Year of non-compliance and failing determinand	Reason for non-compliance
River Yeo	Perry Bridge - Confluence Wrington Stream	2.6	Compliant	

Notes:

1. River is penned, with low flows and extensive algal growth see Issue 4.4. During 1993 a consented farm discharge was identified as being 200 metres upstream of the sampling point. The farmer has since been persuaded to contain farm effluent for disposal to land. We will continue to monitor to ensure future compliance.
2. Two Water Company discharges from a Water Treatment Works (WTW) (filter and mains backwash, sometimes of significant volume and containing low dissolved oxygen levels) were located at the head of the catchment. Bristol Water have relocated one discharge to the Lox Yeo.
3. The watercourse has a sluggish flow and is historically prone to poor water quality. During 1995 this was exacerbated by the prevailing low flow drought conditions over the summer. Several problem consented and unconsented farm and multiple foul sewage discharges in the catchment were thought to be contributing to the poor quality. Parts of the catchment have now been connected to mains drainage. A new sewerage scheme is still under development. Further investigations are planned this year as Agency flood defence weedcutting and watercourse management during the summer may be exacerbating the situation. See Issue 4.4.

4. In 1994 the sampling point was located on the inland lower Kenn, which is penned and cut off by a sluice. The water quality recorded at this point was not typical of the majority of the designated stretch. The sampling point was moved to a more representative site prior to collection of the 1995 data set.

6.5 EC Nitrates Directive

The EC Directive *concerning the protection of waters against pollution caused by nitrates from agricultural sources* (91/676/EEC) protects waters from pollution by nitrates used in agriculture. This Directive requires Member States to monitor the nitrate concentration in freshwaters (surface and ground) and review the eutrophic state of fresh surface, estuarine and coastal waters to identify those that are or could be affected by nitrate from diffuse agricultural sources. The land draining to these polluted waters must be designated as nitrate vulnerable zones (NVZ). In England Action Plans will be established in 1998 to reduce existing nitrate pollution and prevent further pollution. Outside NVZs, Member States must establish and promote a code of good agricultural practice. Regular reviews must be carried out of existing and potential new NVZs. The first must be completed in December 1997, and then at four year intervals.

We are responsible for advising on the selection of, and catchment boundaries of NVZs. The designation of NVZs and agricultural measures to be adopted is the responsibility of Government.

There are at present no NVZs in the North Somerset Rivers Catchment.

6.6 EC Surface Water Abstraction Directive

The EC Directive *concerning the quality required of surface water intended for the abstraction of drinking water in the Member States* (75/440/EEC), protects the quality of surface water used for public supply. This Directive ensures that water abstracted for public supply meets certain quality standards and is given adequate treatment before entering public water supplies.

The Directive sets out standards that must be achieved, for water for public supply which is to be given different levels of treatment.

We are responsible for monitoring the quality of designated surface water abstractions and reporting the results to DETR who decide whether the standards in the Directive have been met. Where standards are not met, we are responsible for identifying sources of pollution and making sure that improvements are made.

There was no confirmed non-compliance with this directive in this catchment.

6.7 EC Dangerous Substances Directive

The EC Directive *on pollution caused by certain substances discharged in the aquatic environment of the community* (76/464/EEC) protects the water environment by controlling discharges to rivers, estuaries and coastal waters.

This Directive describes two lists of compounds. List I contains substances regarded as particularly dangerous because they are toxic, they persist in the environment and they bioaccumulate. Discharges containing List I substances must be controlled by Environmental Quality Standards (EQSs) issued through Daughter Directives. List II contains substances which are considered to be less dangerous but which still can have a harmful effect on the water environment. Discharges of List II substances are controlled by EQSs set by the individual Member States.

We are responsible for authorizing, limiting and monitoring dangerous substances in discharges. We are also responsible for monitoring the quality of waters receiving discharges which contain dangerous substances and reporting the results to DETR who decide whether the standards in the Directive have been met. Where the requirements of this Directive are not met, we are responsible for identifying sources of pollution and making sure that improvements are made.

There are no consented List I Dangerous Substances discharges in this catchment.

We monitor 2 designated sites for List II substances.

Table 4 Dangerous Substances Monitoring Sites Downstream of Registered Discharges: 1996 - List II

Discharge	Receiving Water	Substance
Ubley Hatchery	River Yeo	Copper
Jacklands Bridge Fish Farm	Land Yeo	Copper

Between 1993 - 1996 there were no EQS failures for copper at these sites.

6.8 EC Urban Waste Water Treatment Directive

The EC Directive *concerning urban wastewater treatment* (91/271/EEC) specifies minimum standards for sewage treatment and sewage collection systems.

This Directive specifies that secondary treatment must be provided for all discharges serving population equivalents greater than 2,000 to inland waters and estuaries, and greater than 10,000 to coastal waters. Discharges below these population equivalents receive *Appropriate Treatment* as defined in the Wessex Water Services Ltd's Asset Management Plan (known as AMP2, this is the water company's medium term investment plan) guidance note. We are responsible for making sure that discharges receive the level of treatment specified in this Directive.

This Directive also requires higher standards of treatment for discharges to *Sensitive Areas*, and/or lower standards of treatment to *Less Sensitive Areas*. Sensitive areas are those waters that receive discharges from population equivalents of greater than 10,000, and are or may become eutrophic in the future.

The DETR decide if a watercourse is *Sensitive*, based on monitoring information provided to them by the Environment Agency. We also ensure that discharges to *Sensitive Areas* receive a higher level of treatment.

Less Sensitive Areas or *High Natural Dispersion Areas* (HNDAs) are those estuarine or coastal waters which are naturally very dispersive. In these areas a lower level of sewage treatment is required. However, dischargers must demonstrate that no harm will be caused to the environment by the lower level of treatment. We are responsible for ensuring that these studies are carried out correctly.

There are no candidate *Sensitive Areas* or *Less Sensitive Areas* in the catchment.

There are no *Appropriate Treatment* schemes in the catchment.

There are 2 discharges that require improvements under this Directive. These are Kingston Seymour and Portbury, both requiring secondary treatment. Both of these schemes are detailed in the Severn Estuary Strategy Joint Issues Report (May 1997).

6.9 EC Shellfish Waters Directive

There are no designated shellfisheries in this Plan Area.

6.10 EC Shellfish Hygiene Directive

There are no shellfish hygiene sites in this Plan Area.

Map 8 - Biological Quality - 1995



6.11 EC Groundwater Directive

The EC Groundwater Directive (80/68/EEC) controls the release of certain substances to groundwater. There are two lists of substances: List I substances, which should not be released and List II substances, which can only be released in limited amounts. Currently the principles of the Groundwater Directive are implemented only through our waste management activities and by controlling the discharge of effluents to soakaways.

Other potential sources of List I and List II substances such as sheep dip spread on land and some industrial effluents spread on land are less well regulated. Consequently the Department of the Environment, Transport & the Regions is currently consulting on new regulations under the European Communities Act 1972 to bring all such currently unregulated discharges under control. The anticipated date for implementation is early 1998.

There are no statutory standards for the quality of groundwater, and because of the difficulties in obtaining and interpreting information we have only limited data on the impacts of human activity on groundwater quality. However in drought conditions most of the flow in rivers is derived from groundwater and our river monitoring data indicate that throughout most of the region there are no known major areas of contaminated groundwater. However, local contamination of the groundwater public supply source - Cold Bath Spring - has occurred (see Issue 4.7).

6.12 Biological Quality

Biological river quality is based on the diversity of aquatic invertebrate life, the small animals present in the river. They are unable to move far and respond to long term conditions within the watercourse. This provides a good indication of the biological condition of the river. In order to present biological river quality, a Biological Classification has been devised.

The Biological Classification describes biology in terms of a shortfall from that expected under conditions of good water quality; there are 6 classes. The classification for this catchment is shown on Map 8.

Table 5 Biological Class Descriptions

Biological Class	Description
a	Very good
b	Good
c	Fairly good
d	Fair
e	Poor
f	Bad

During our 1995 biological survey, 14 river reaches within the North Somerset Rivers Catchment area were sampled. Of these 5 achieved class a (very good), 6 class b (good) and 3 class c (fairly good). No reaches fell within classes d (fair), e (poor) or f (bad). One reach of the Land Yeo in Clevedon has been downgraded since 1990 from class a to class c (see Issue 4.6), and the poor chemical quality (class e) suggests the deterioration may be real. In contrast, the River Yeo downstream of Blagdon, and as far as Wrington, improved between 1990 and 1995, these reaches being upgraded from class c to class a.

Apart from localised pollution incidents, there have been recurrent, if infrequent, problems caused by chlorinated discharges from Banwell Water Treatment Works on the upper section of the Banwell. These discharges have adversely affected the invertebrate communities with a particular impact on freshwater shrimps (*Gammarus pulex*). Remedial works have been completed and recovery of the invertebrate community is anticipated. In the lower parts of the catchments, summer flow conditions often result in symptoms of eutrophication including algal blooms and excessive growth of duckweed (*Lemna*). Both can result in reduced levels of dissolved oxygen in the water, causing distress to fish (see Issue 4.4).

Much of the main river network within the LEAP area is subject to regular silt removal and weed cutting to maintain efficient drainage. These activities often result in oxygen depletion and can produce poor biological classification through disturbance and loss of habitat, even when water quality is otherwise good. This effect is believed to have caused the low biological class c on the River Yeo in Congresbury, where all other evidence suggests water quality is good (see Issue 4.6). Investigations into the biological impact of this work are being carried out, with the objective of formulating working practices which will meet flood defence needs while limiting the environmental impact of the works.

7. Groundwater Protection

The protection of groundwater both public and private is of great importance since once pollution has occurred it is extremely difficult, if not impossible to clean up, and this will always be expensive. Pollution can put drinking water supplies at risk, and may impact on river water quality where the baseflow is dependent on groundwater.

The Policy and Practice for the Protection of Groundwater (PPPG) (NRA 1992) contains policy statements on the following aspects of groundwater protection:

- physical disturbance of aquifers affecting quality and quantity
- waste disposal to land
- contaminated land
- disposal of sludges and slurries to land
- diffuse pollution
- other activities affecting groundwater quality.

We commit substantial resources to groundwater protection, and apply the PPPG through our own authorizations. We also seek to protect groundwater quality in our role as a statutory consultee to the planning authorities. Many of the policies are not supported by a formal role of the Agency, but rely on us to persuade and educate landowners of the benefits of good practice.

The document describes the principles of Groundwater Vulnerability and Source Protection Areas (see Map 9), and the publication of these is an integral part of the implementation of the PPPG. Groundwater Vulnerability Maps show the location of aquifers and classify their vulnerability according to the properties of the soil and underlying strata. These maps allow planners, developers and regulatory bodies to make better informed judgements on the location of new developments, avoiding potentially polluting activities in high vulnerability areas.

Source Protection Areas are now available for the majority of large abstractions for potable supply, although such Areas are never definitive and can be modified in the light of improved information. It must be noted that all aquifers need protection, not just those falling within Source Protection Areas. We will seek to include policies relating to groundwater protection in Structure and Local Plans.

Map 9 - Groundwater Source Protection Areas



8. Air Quality

Ambient concentrations of smoke and sulphur dioxide have generally declined in the UK as a whole over the last 20 years. Similarly, both the quantity released and the concentration of lead in the atmosphere has declined since the mid 1980s following the introduction of lead free petrol. However, the release of some pollutants such as nitrogen oxides, carbon monoxide and volatile organic compounds have remained relatively stable during this period, although there may have been changes in their source. For example, releases of oxides of nitrogen from industrial sources have generally declined whilst emissions from road traffic have increased.

With the exception of ground level ozone (see Section 8.4), ambient levels of these pollutants are generally lower in the South West of England than in many other parts of England and Wales. There are no breaches of air quality standards known to be caused by authorized IPC processes in the catchment.

The Environment Agency has published *The Environment of England and Wales - a Snapshot (April 1996)* which contains information on air quality in the UK. Local authorities have the major responsibility for managing air quality. (See Sections 8.2 and 8.3).

8.1 Monitoring

There are more than 400 ambient air quality monitoring sites dotted around the UK providing data to a central computer. An air quality information service is available on freephone telephone number 0800 55 66 77 and on Ceefax pages 404, 410-414, Teletext page 106. Information is also available on the Internet at <http://www.open.gov.uk/doe/doehome.htm>.

Local authorities carry out ambient air quality monitoring in the catchment area, generally using mobile or passive techniques and carried out by Bristol Scientific Services. There are no continuous fixed monitoring sites operated by North Somerset District Council in the catchment area nor are dust deposition gauges used. There are plans in the future to use passive diffusion tubes for 1,3 butadiene, sulphur dioxide, carbon monoxide and volatile organic compounds. Other pollutants being considered for monitoring include ozone, lead and particles in consultation with other adjacent authorities.

8.2 National Air Quality Strategy

Under Part 4 of the Environment Act 1995 the Government is required to publish a national strategy for air quality including:

- a framework of standards and objectives for the pollutants of most concern
- a timetable for achieving objectives
- the steps the Government is taking and the measurements it expects others to take to see that objectives are met.

The strategy was published in March 1997. We will be working closely with local authorities to help achieve the objectives of the National Air Quality Strategy, principally through our regulation of emissions to air from controlled ("Part A") major industrial processes under Integrated Pollution Control (IPC) (see Section 23). Local authorities are responsible for the regulation of smaller, less complex ("Part B") industrial processes, as well as road traffic management.

8.3 Local Air Quality Management Areas

In due course air quality standards may be prescribed in regulations made by the Government and obligations placed on local authorities regarding the establishment and operation of local air quality management areas. Local authorities will have to carry out periodic reviews of air quality in their areas. Where standards are not being met or are not likely to be met they will make action plans to improve air quality in these areas.

A pilot study (one of 14 in the UK) took place in Cornwall in 1996. Actions that come out of the pilot study, the Cornwall Air Quality Forum, may show the way forward to dealing with air quality issues in the area covered by this Plan.

8.4 Ground Level Ozone

Ozone in the upper atmosphere shields the earth from harmful UV radiation. At ground level however, ozone can be a harmful pollutant damaging crops and building materials and causing respiratory difficulties amongst sensitive people. Ozone is not emitted directly from any man-made source in any significant quantities, but arises from complicated chemical reactions in the atmosphere driven by sunlight. In these reactions, oxides of nitrogen and hydrocarbons (derived mainly from vehicle exhausts) react in the atmosphere to produce ozone. These chemical reactions do not take place instantaneously, but over several hours or even days, and once ozone is produced it may persist for several days. In consequence, ozone produced at one site may be carried for considerable distances in the air, and maximum concentrations usually occur away from the source of the primary pollutants. The highest concentrations of ozone generally occur during hot, sunny and relatively windless days in summer.

In common with other parts of Southern England, ozone levels in the catchment are generally above those at which damage to vegetation may occur. The Expert Panel of Air Quality Standards (EPAQS) recommend an Air Quality Standard for ozone in the UK of 50 parts per billion (ppb) as a running 8-hour average whilst the World Health Organisation recommends a vegetation growing season guideline mean of 30 ppb.

An urban ozone monitoring station in the adjacent Avon catchment at Bristol Centre came on line in 1993. Results obtained so far are summarized in Table 6 and show progressive increases typical of locations in Southern England.

Table 6 Ground Level Ozone Bristol City Centre

	1993	1994	1995	1996
Number of days in each year when running averages exceeded recommended AQS of 50 ppb	3	6	19	11*
Highest running 8 hour averages for period 1993-1996 (ppb)	74	61	82	73
Hourly mean maxima for period 1993-1996 (ppb)	89	74	93	79

Source of data: the United Kingdom National Air Quality Strategy * 1996 data provisional

8.5 Volatile Organic Compounds

The Department of Environment has published a UK strategy on the reduction of emissions that can produce ozone. Nationally the Environment Agency will have an input into the reduction of volatile organic compounds (VOCs) and oxides of nitrogen (NO_x), both of which are precursors in the formation of ground level ozone. VOC and NO_x releases from IPC processes are controlled by limits in authorizations. These limits will be reduced over time as operators move towards new plant standards.

8.6 Sulphur Dioxide

Sulphur dioxide is toxic to plants and human health. An environmental quality criteria for effects on natural vegetation recommended by the World Health Organisation is 7.5 ppb as an annual average. Human health effects are best gauged by reference to the recommended standard from EPAQS - 100 ppb as a 15 minute average (there is no data from sites west of Bristol available as a 15 minute average). In common with other sites in the Department of the Environment's basic Urban Network in England and Wales the annual mean concentration of sulphur dioxide in this area has fallen due to a reduction in the use of sulphur containing fuels. Data for the past ten years (April to March) measured in the adjacent Avon Catchment in Bristol are given in Table 7

Table 7 Sulphur Dioxide Annual Mean Concentration, Bristol

Sulphur Dioxide Annual Mean Concentration, parts per billion (ppb)									
87/8	88/9	89/90	90/1	91/2	92/3	93/4	94/5	95/6	96/7
10.9	6.3	9.0	7.5	7.5	7.5	6.7	6.4	5.9	4.2

Source of data: Bristol City Council and "Air Quality A to Z", June 1995. Meteorological Office and Air Quality Division, DETR

8.7 Nitrogen Dioxide

Nitrogen dioxide is also toxic to plants and humans. Concentrations are subject to the EC Directive Air Quality Standards for Nitrogen Dioxide (85/203/EEC) and should not exceed 104 ppb for more than 175 hours per year (based on the 98th percentile of hourly averages.) This is generally not exceeded if the annual mean is less than 40 ppb. A comprehensive nitrogen dioxide survey undertaken particularly around Weston-super-Mare but also at Felton, Nailsea, Long Ashton, Failand, Wraxall and Ham Green confirms an average level of around 20 ppb but passive diffusion tube samples taken at Junctions 20 and 21, Clevedon and Weston-super-Mare of the M5 motorway show levels at or above 40 ppb. On one occasion maximum of 60 ppb was recorded in April 1996 at Junction 21 of the M5 motorway.

The World Health Organisation (WHO) and United Nations Economic Commission for Europe (UNECE) have recommended an air quality guideline of 30 micrograms/m³ (15.7 ppb) for effects of nitrogen oxides (NO₂ and NO) on vegetation.

8.8 Acid Rain

Acid rain is caused mainly by burning fossil fuels but can also come from natural sources such as organic decay on land or under water, volcanic eruptions and lightning strikes. The main emissions responsible for acid deposition are sulphur dioxide and oxides of nitrogen. Ammonia which arises mainly from agriculture also plays a part. In some parts of the UK, natural ecosystems have a significant capacity to neutralize acidity and acid deposition has little impact on them, but in acid sensitive areas, acid rain degrades the land and causes damage to plants and soils in which they grow. Acid rain components which contain nitrogen have the effect of acting as a fertilizer; this can change the make up of communities of land and water plants and affect animals that live on them.

In 1994, a protocol was agreed under the UNECE to reduce exceedences of critical loads - the rates of sulphur deposition which ecosystems and other targets can tolerate in the long term without suffering damage. The UK agreed to reduce its sulphur dioxide (SO₂) emissions by 80% by 2010 from a 1980 baseline. The UK's sulphur strategy published in December 1996 (Reducing Emissions of Sulphur Dioxide, A Strategy for the United Kingdom) indicates that the UK will meet interim targets for 2000 and 2005. Compliance is also expected with the 80% reduction target for 2010. Critical load exceedences however will continue to some sensitive sites (see Map 10). In January 1997 the European Commission published a draft strategy on acidification which aims to further reduce critical load exceedences for both sulphur and nitrogen.

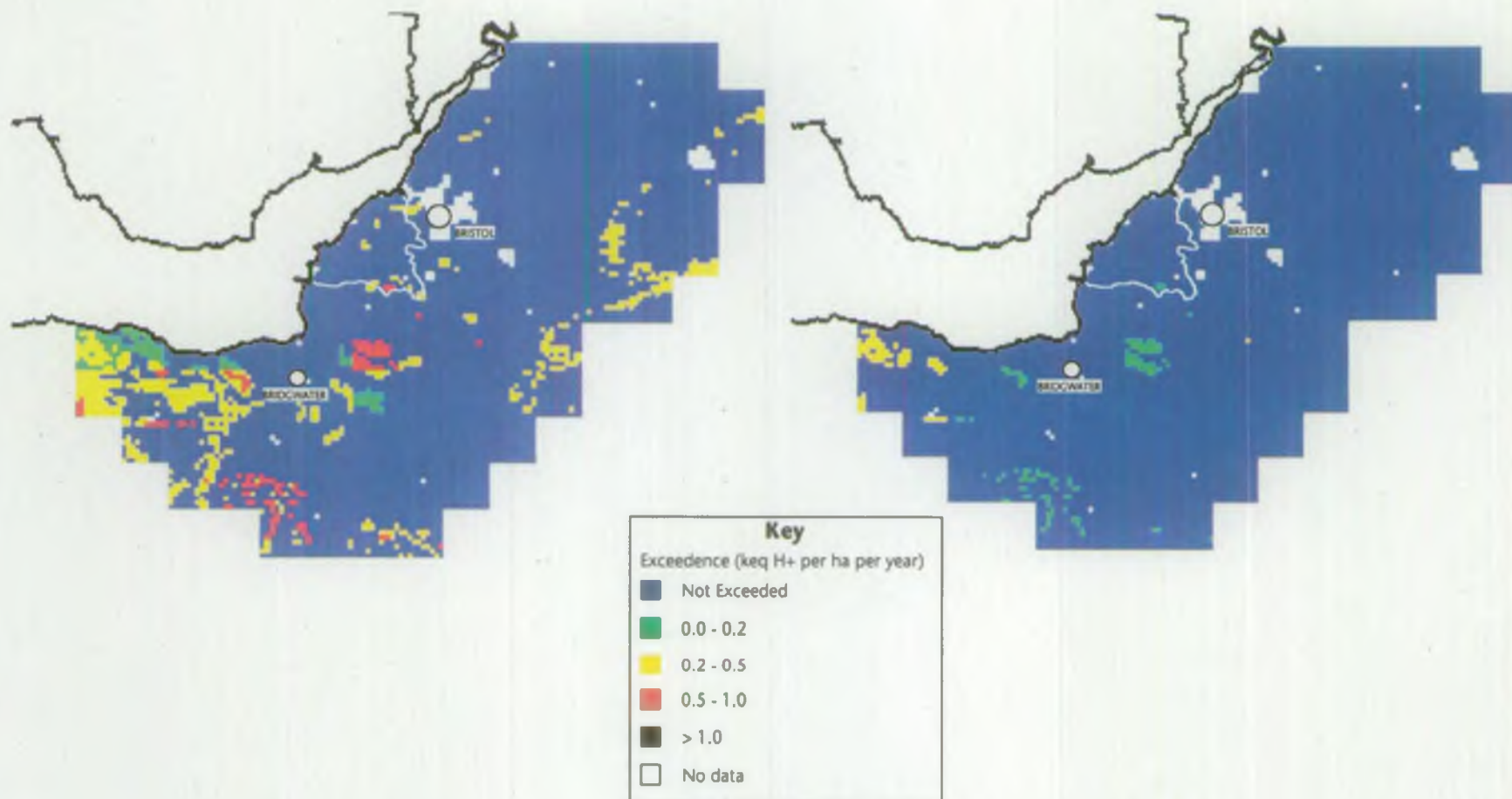
8.9 Benzene

Benzene is acknowledged to be a human carcinogen causing non-lymphocytic leukaemia on long term exposure. The main sources of benzene are motor vehicles, EC legislation currently stipulates an upper limit of 5% by volume of benzene in petrol; currently the volume in the UK is running at 2% on average. The Expert Panel on Air Quality Standards (EPAQS) considered the medical evidence for carcinogenic effects from benzene and derived a recommended standard of 5 ppb as a running annual mean, which would represent an exceedingly small risk to health. A comprehensive survey undertaken particularly around Weston-super-Mare but also at Felton, Nailsea, Long Ashton, Failand, Wraxall and Ham Green confirms an average level of between 1 and 2 ppb, with a maximum isolated figure of 3.5 ppb at Junction 20 of the M5 motorway at Clevedon. These measurements are typical of other urban UK areas where it is possible to achieve mean benzene concentrations of between 9.6 and 11.6 ppb at kerbsides and adjacent to heavily trafficked roads.

Map 10 Exceedences of Critical Loads of Acidity for Soils

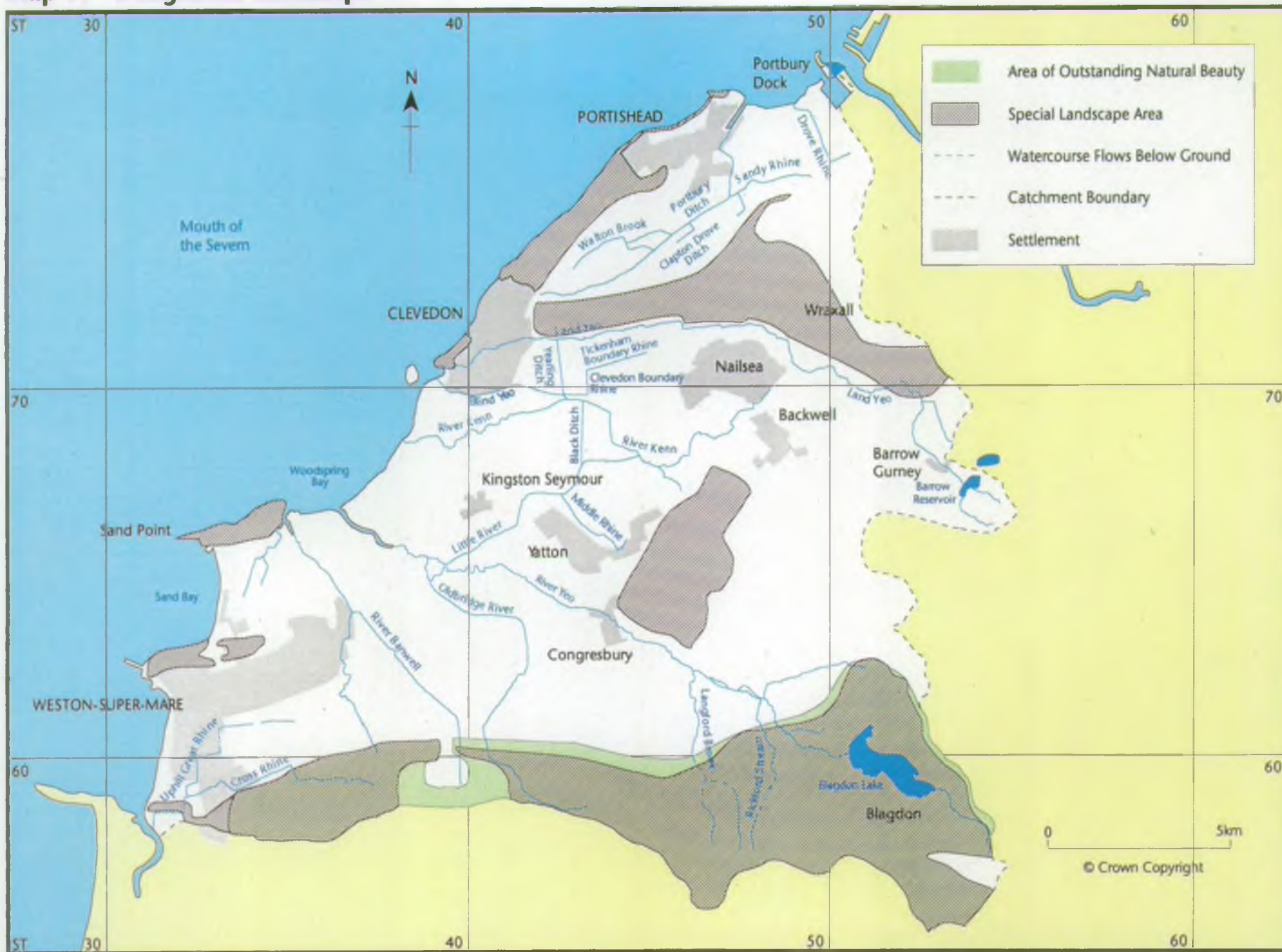
Modelled Sulphur Deposition for 1995

Modelled Sulphur Deposition for 2005



Source: Critical Loads Mapping and Data Centre, ITE Monks Wood - Data acknowledgement: Hull and Edinburgh Universities Critical Loads Advisory Group Soils Sub-Group.

Map 11 - Designated Landscape



9. Landscape

The landscape character of the North Somerset Rivers Catchment is essentially rural, and is dominated by a series of limestone ridges; the Mendip Hills to the south, the Dundry Plateau through the central and eastern part of the catchment, and the Severn Ridge to the north. These ridges are separated by extensive open wet lowland levels and moors, the Gordano Valley, the North Somerset Vales and coastal levels and moors.

There is a long history of human occupation within the catchment that has helped to shape the natural features into the landscape present today. Future generations will continue to modify the highly valued landscape both for pure enjoyment and for the resolution of their economic problems.

The Mendip Hills, which are designated as an Area of Outstanding Natural Beauty (AONB), rise almost 300 m above sea level to the highest point in the catchment (see Map 11). Their distinctive landscape characteristics owe their nature to the underlying geology and more than 4000 years of human influence, indeed the prehistoric landscape is still evident. The hills are dominated by steeply wooded escarpments with extensive areas of upland bracken and heather moor, deep combs and steep wooded valleys, small field systems with drystone walls and forestry plantations.

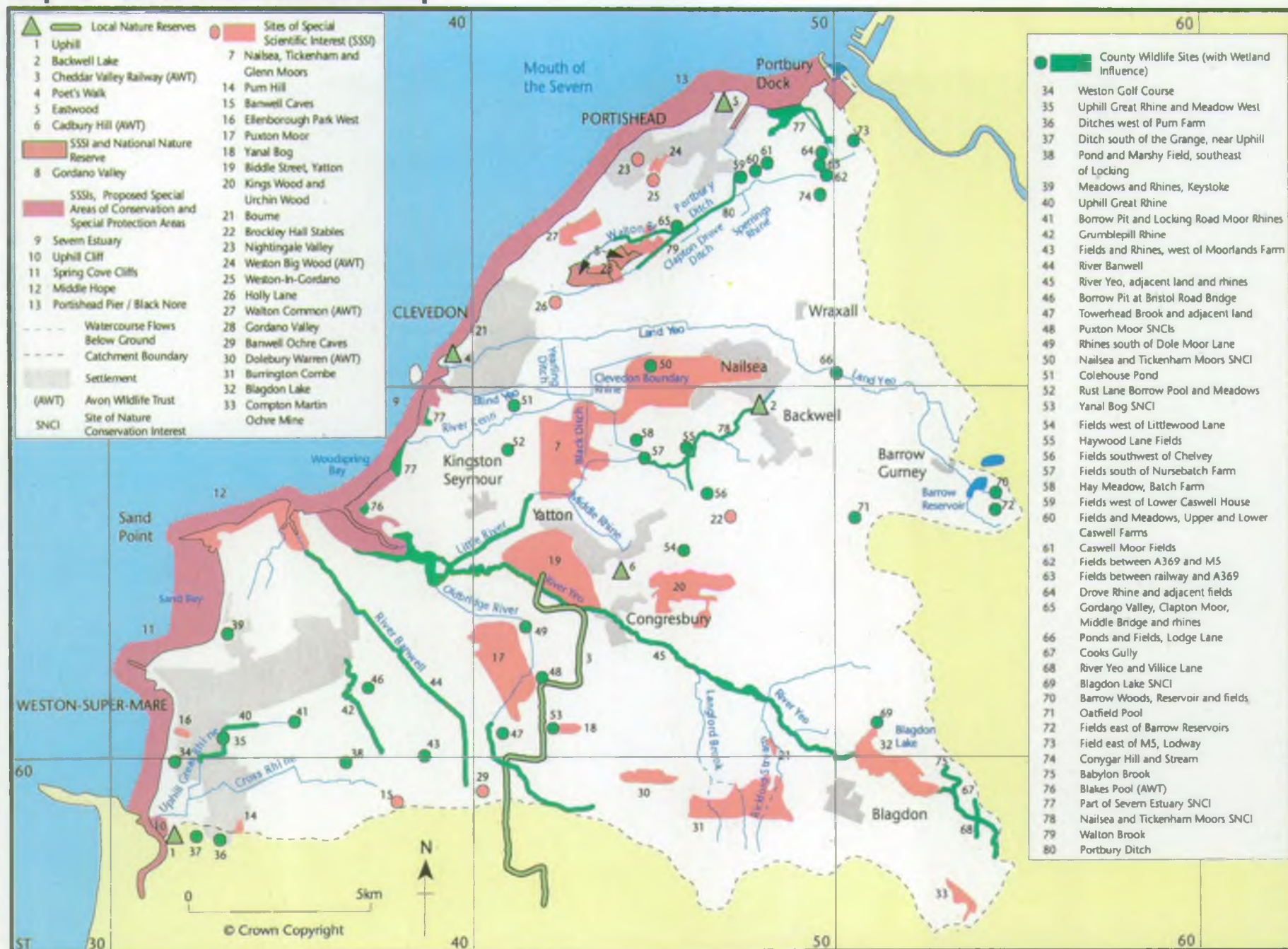
The Dundry Plateau and Severn Ridge are more gently undulating with broad plateaux. Their character is dominated by extensive areas of broad-leaved woodland and large fields bordered by mature hedgerows. These hills have a number of quarries which to some degree detract from the landscape value of the area. However, a number are of significant national and regional geological interest and have been designated Sites of Special Scientific Interest (SSSI).

The North Somerset Levels and Moors form an almost continuous flat belt along the coastal area of the catchment, with extensions into the adjacent valleys and are of significant landscape and conservation interest. These areas are characterized by a wide open landscape with coastal saltmarshes and embankments, a network of rivers, rhines and ditches, wetland habitats, hedgerows, meadows and orchards. These level areas are supplied with water from rivers that flow from vales or valleys between the adjacent hills, and are dominated by meadows and mature hedgerows.

Extensive areas of the catchment are designated as Priority Landscape Conservation Areas, these are protected by both Structure and Local Plan policies. In the past these policies have largely overlooked the levels and moors areas. However, these shortfalls are now being addressed in the North Somerset Countryside Strategy and by the North Somerset Levels & Moors Partnership. Other areas have been identified as Priority Landscape Improvement Areas within these Plans.

For further detailed information please refer to the following documents: Avon County Structure Plan, Woodspring District Wide Local Plan, Avon Landscape Strategy, Forest of Avon Plan, North Somerset Countryside Strategy, Landscape Assessment of the Mendip Hills, English Nature Natural Area Profile.

Map 12 - Conservation Resource Map 1



10. Wildlife

We have duties to conserve and enhance wildlife, especially in rivers and wetlands. We also have a general duty to promote conservation, particularly in the aquatic environment. An important part of our work is to influence land use planners and land managers to look after rivers and wetlands sensitively.

10.1 Designated areas

The North Somerset Rivers Catchment supports some nationally important areas of high nature conservation value with some of the best examples of biologically rich rhine and ditch systems in the South West. The catchment's coastal boundary is the Severn Estuary which is designated as a Special Protection Area (SPA) and a RAMSAR. The North Somerset Levels and Moors have missed out on the recognition and biodiversity enhancements that the Environmentally Sensitive Area (ESA) across the Somerset Levels and Moors has brought. However recent developments have resulted in the area being specifically targeted for MAFF's Countryside Stewardship Scheme through which ecological maintenance and enhancement can be managed for.

The EC Habitats Directive seeks to protect habitats and species of European importance by designating Special Areas for Conservation (SACs). The process of defining the Severn Estuary SAC is underway and will be completed by 1998.

There is one National Nature Reserve (NNR) within the catchment, this forms part of the Gordano Valley complex of important wetland sites. There are also six Local Nature Reserves (LNRs), at Uphill, Cheddar Valley Railway, Eastwood, Poet's Walk, Cadbury Hill and Backwell Lake. Each site has its own special local interest and is a valuable resource for both people and wildlife. The Wildlife Trust manages 14 Nature Reserves throughout the LEAP area, including Clapton Moor, an extensive area of moor landscape and network of species-rich rhines.

There are twenty-six Sites of Special Scientific Interest (SSSIs) (see Map 12), a number of which contain important wetland habitats and large areas of open water. There are forty-seven County Wildlife Sites designated Sites of Nature Conservation Interest (SNCIs) within the catchment with a dependence on, or are influenced by, the water environment. These are protected by both Structure Plan and Local Plan policies.

The North Somerset Levels and Moors have enjoyed greater interest in the recent past from the various countryside and conservation organizations within the area. As a result of the interest a partnership project is promoting the area's conservation importance.

10.2 Habitats

English Nature has divided the country into "Natural Areas" on the basis of land use and ecology. The North Somerset Rivers Catchment is divided between a number of these areas, namely Severn and Avon Vales, Bristol, Avon Valleys and Ridges, Mendip Hills and Somerset Levels and Moors. Key habitats have also been identified, the most significant type closely linked to the water environment are: open water, rivers and streams, ditches and rhines, lowland wet grassland, reedbed and carr communities such as those found within the Gordano Valley NNR; species rich rhines and ditches such as on Puxton Moor SSSI. Coastal habitats of importance extend throughout the catchment and support areas of remnant salt marsh, extensive mudflats, sandy shore, shingle and coastal cliffs.

10.3 Biodiversity

The European Union is concerned about the decline in biodiversity (the variety of life on earth). As a result member states are producing Biodiversity Action Plans (BAPs) under the terms of the EC Species and Habitats Directive in an effort to halt and reverse the decline of both species and habitats. The UK Biodiversity Plan lists key habitats and species which need protection, through Regional and Local Biodiversity Action Plans. The Regional Biodiversity Plan for the South West, "Action for Biodiversity in the South West", was published in June 1997. The Regional and Local Plans are currently being developed by local authorities and others.

• Page 44



North Somerset Rivers Local Environment Agency Plan

We are working with a number of organizations to formulate habitat and species action plans at both regional and local levels over the next 5 to 10 years, including:

- The South West Regional Biodiversity Action Plans (BAPs)
- Local BAPs
- Local Agenda 21 Action Plans

Biodiversity targets could include the maintenance and establishment of habitats, such as reedbeds, coastal and floodplain grazing marsh, rivers and streams. Target species could also include assessment and maintenance of populations of native white-clawed crayfish, water-vole, otter and great-crested newt (see Section 10.5 and Issue 4.1).

10.4 Survey Information

The Agency has undertaken River Corridor Survey and River Habitat Survey on a number of the rivers within the catchment (see Map 13). This survey map records and evaluates the conservation resource within the rivers. Other biological records for the area are held at Bristol Regional Environmental Records Centre.

10.5 Important Species

Within the catchment as a whole there has been much survey work undertaken, in particular the levels area as part of the "English Nature Rhine and Ditch Survey" (1992). This series of reports have greatly helped in the assessment of the levels and moors and the designation of wetland SSSIs.

Water-voles - The Agency has supported The Wildlife Trust in recording the status and distribution of water-voles within the area. However, they were not found at the time of the survey. The levels and moors provide an extensive area of apparently suitable habitat and future research will be undertaken in conjunction with other organizations to examine the reasons for their absence. The water-vole is fully protected under the Wildlife and Countryside Act (1981).

Otters - The Agency has also worked with the Wildlife Trust in trying to define the corridor routes being used by otters into and out of the catchment. The indications are that otters are present in the catchment, however, their numbers are likely to be very low, reinforcing the need to improve appropriate habitats. A local Watch Group have played an important role in constructing otter holts on land in the catchment. Otters are fully protected under the Wildlife and Countryside Act (1981).

Wetlands - The catchment supports a wide variety of wetland habitats and species.

The unimproved wet-meadows support numerous flowering plant species including Sneezewort (*Achillea ptarmica*), Marsh Marigold (*Coltha palustris*), Lesser Spearwort (*Ranunculus flammula*), Marsh Arrowgrass (*Triglochin palustris*) and Marsh Orchid (*Dactylorhiza praetermissa*). The Gordano valley is one of the few remaining sites for the nationally rare Brown Galingale (*Cyperus fuscus*), this species is given special protection under Part 1 the Wildlife and Countryside Act (1981).

The ditches and rhines within the catchment contain numerous important aquatic plant species. These nationally scarce species have been recorded, Rootless Duckweed (*Wolffia arhiza*), Soft Hornwort (*Ceratophyllum submersum*), Greater Water parsnip (*Sium latifolium*), Whorled Water milfoil (*Myriophyllum verticillatum*) and Fen Pondweed (*Potamogeton coloratus*). Other notable species include Frogbit (*Hydrocharis morsus-ranae*), Lesser Water plantain (*Baldellia ranunculoides*) and Arrowhead (*Sagittaria sagittifolia*). Emergent ditch vegetation includes species such as Branched Bur-reed (*Sparganium erectum*), Tubular Water-dropwort (*Oenanthe fistulosa*) and Water Plantain (*Alisma plantago-aquatica*). Flowering Rush (*Butomus umbellatus*) and Cyperus Sedge (*Carex pseudocyperus*) are also present both of which are declining.

Lowland mire communities within the catchment, such as Yanal Bog SSSI support species such as Meadow Thistle (*Cirsium dissectum*), Dyers Greenweed (*Genista tinctoria*), Marsh Arrowgrass, Fen Bedstraw (*Galium uliginosum*), Devils Bit-Scabious (*Succisa pratensis*), Southern Marsh Orchid (*Dactylorhiza praetermissa*), Common Spotted Orchid (*Dactylorhiza fuchsii*) and Saw-wort (*Serratula tinctoria*).

Several notable invertebrates have been recorded within the catchment. The ditch and rhine systems support the nationally rare Soldier Flies (*Odomyia ornata* and *Stratiomys potamida*), the nationally scarce Hairy Dragonfly (*Brachytron pratense*) and the Variable Damselfly (*Coenagrion pulchellum*), Ruddy Darter (*Sympetrum sanguineum*) and the locally scarce Black Darter (*Sympetrum danae*). The nationally rare (Red Data Book category 3) aquatic snipe fly (*Atrichops crassipes*) was recorded upstream of Congresbury in 1995.

Both the Severn Estuary and Blagdon Lake support internationally important bird populations of Redshank, Dunlin, Curlew, Whimbrel, Teal, Mallard, Tufted Duck, Pochard, Widgeon, Coot, Gadwall, Pintail, Shoveler, Goldeneye, Great-Crested Grebe and Little Grebe. All visit at various times of the year, however, it is the passage and winter periods that are most important for migratory overwintering wildfowl and waders.

Many notable bird species visit the levels area, breeding birds include Lapwing, Snipe, Redshank, Grasshopper Warbler, and Reed Warbler. In the Gordano Valley Long and Short-Eared Owls overwinter and Barn Owls breed, feeding mainly on field voles living in the bankside habitats.

Kingfishers, Grey and Yellow Wagtails are infrequent, but are present on most of the rivers within the catchment. Herons are a common sight and there are several important heronries.

10.6 North Somerset Levels and Moors Project

The North Somerset Levels and Moors Project is a partnership between North Somerset Council, English Nature, the Wildlife Trust, the Countryside Commission and the Environment Agency. The Project aims to promote greater appreciation and enjoyment of the countryside and encourage the sympathetic management of the grasslands, rhines and ditches and hedgerows that cross the project area. The partnership works closely with landowners, farmers and local people.

10.7 Other Wildlife Projects

The North Somerset Countryside Strategy launched by North Somerset Council in 1995 is both an audit and a set of objectives for wildlife, landscape, archaeology and recreation. The document has raised many issues relating to the uses of the countryside and will continue to be an important document for future discussion making.

The Farming and Wildlife Advisory Group plays a major role in improving agricultural practice on farms throughout the catchment. For example, there are some particularly impressive farm schemes in the Yeo valley that have included pond, hedgerow and woodland restoration and discussions are taking place to undertake some river rehabilitation work on the Langford Brook (see Issue 4.5.2).

MAFF's Countryside Stewardship grant scheme continues to assist farmers to adopt environmentally sensitive farming practices. Again there are numerous agreements in operation particularly on the Mendip Hills and within the levels and moors, of particular note are the Countryside Stewardship payments to establish buffer strips.

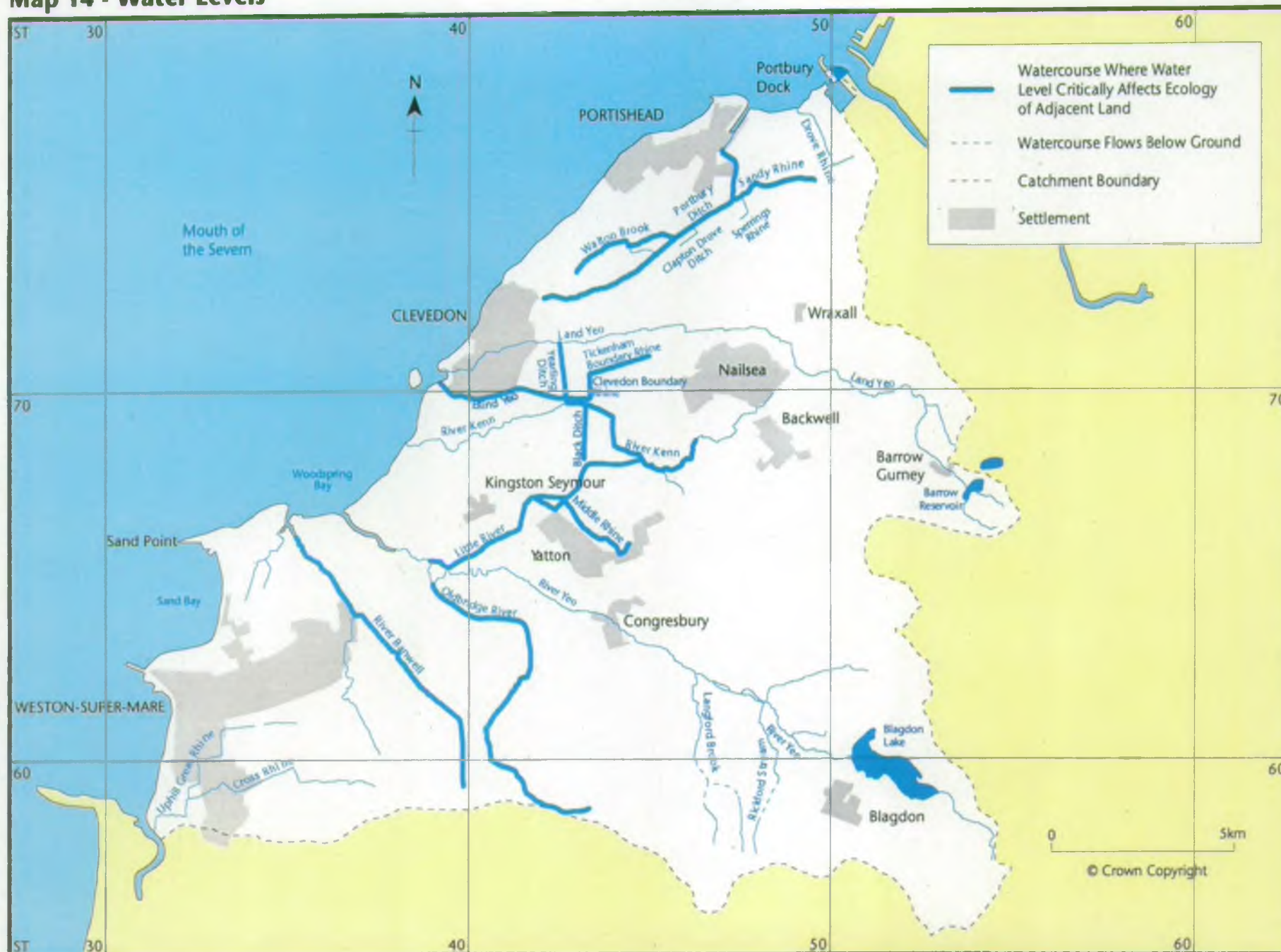
10.8 Water Levels and Ecology

Map 14 shows those watercourses where water levels critically affect the ecology of adjacent land - a considerable proportion of the rivers in this catchment.

10.9 Invasive Plants

Invasive plant species including Himalayan balsam are widespread throughout the catchment, there is a general spread of the non-native plants along the river margins, often at the expense of native species. Some of the channels which are regularly dredged tend to have disturbed plant communities developing on their banks. These can include species such as oilseed rape for example along the River Yeo at Congresbury.

Map 14 - Water Levels



Map 15 - Managed / Natural Rivers



11. Archaeology

This catchment contains a wealth of archaeological remains of both national and international importance; there are many Scheduled Ancient Monuments (SAMs) (see Map 13). Whilst a great deal is known about this area, many archaeological sites remain undiscovered.

The archaeology of the levels is difficult to interpret, the visual landscape being based largely on medieval and later periods in history, with field patterns and drainage systems. Earlier archaeological evidence is usually buried under the alluvial deposits.

The archaeological evidence from the low lying coastal area and the intertidal zone has many similarities with that found across the levels. Deposits are waterlogged; organic evidence such as wood, fabric, leather and foodstuffs are far better preserved in these wet conditions, thus providing a valuable archaeological resource.

Some of the important sites are the Wemberham Roman villa and the earlier drainage and sea defences of the area which began during the period of Roman occupation as cultivation extended on the levels. From the fourth century the levels were virtually abandoned until the eight or ninth century. From this period on, the complex systems of land division were characterised by open fields and ditches.

Some of the earliest records of human activity within the catchment are found in the Mendip caves, dating from a prehistoric age. There are examples from the Middle Palaeolithic at Uphill and Mesolithic burials at Avelines Cave in Burrington Combe. These are of significant national importance to archaeology.

The upland parts of the catchment often support a very different historical record. Many of the limestone areas have remained uncultivated and so many large earthwork structures have survived such as the Bronze Age hill fort at Dolebury Warren.

Many of the towns and villages within the catchment have historic centres, they usually have at the core of the community the village church and often older burial grounds, together with the manor house and farm. In other villages the church may be found on the edge of the settlement. In some cases this represents the centre of past deserted villages. Many archaeological sites both discovered and undiscovered are located in wetlands and alongside watercourses. The Agency takes care to avoid damage to these sites when carrying out its flood defence and other duties.

12. Fisheries

12.1 Fish Populations

The distribution of the main types of fish found in the catchment is shown on Map 16. The River Yeo has the only substantial brown trout population and the headwaters supply the internationally famous fishery of Blagdon Lake. Although parts of the river are stocked some of the trout population is self supporting with the Rickford Stream and Langford Brook as important spawning and nursery areas. Below Congresbury Weir the River Yeo is a coarse fishery with a limited population of species such as roach, gudgeon and pike and a good eel population.

Research commissioned by the Agency and its predecessors has highlighted the significance of obstructions to elver and eel migration caused by water control structures. We are reviewing the impact of key structures on eel migration and investigating ways of alleviating any problems identified.

The River Banwell once had a small trout population downstream of the spring but elsewhere does not support a significant fishery though there are localised populations of coarse fish species in the lowland reaches.

The man-made New Blind Yeo, together with the River Kenn upstream of Kenn Pier and the lower reaches of the Land Yeo form a complex network which supports an important coarse fishery with good numbers of roach, bream, carp, tench, pike and eels.

The Portbury Ditch has a coarse fish population with some good tench, roach, pike and eels.

Fishery surveys on the River Yeo were undertaken in 1986 and 1994. Reports are held in our regional library in Exeter.

12.2 Angling

The main waters used for angling are shown on Map 17. The River Yeo is fished for trout at various points between Blagdon Lake and Congresbury. Although there is some coarse angling on the lower reaches of the River Yeo the principal area for coarse fishing is the New Blind Yeo and its associated watercourses.

There are a number of significant stillwaters in the catchment where angling takes place. Blagdon Lake has a special place in angling history as the first English water supply reservoir open to the public for trout fishing. Until recently the only stillwaters available for fishing were the water supply reservoirs for trout and a number of railway bridge borrow pits used for coarse fishing.

In the last few years several new fisheries have been established in the catchment including a trout fishery near Wraxall and several stillwaters for coarse fishing near Congresbury and Kingston Seymour.

12.3 Commercial Fishing for Wild Fish Stocks

There is some elver fishing along the coastline of the catchment where the various freshwaters discharge.

At Blagdon Lake there is a licensed trap to catch silver eels leaving the reservoir at times of high flow. We will continue to monitor eel numbers and consider further regulation of commercial fishing if appropriate.

A licence is required for both eel and elver fishing; the method of fishing and the instruments which can be used are defined by byelaws. Eel fyke nets must be fitted with otter guards which are available from the Agency. Licence holders are required to make an annual catch return.

Map 16 - Fisheries



North Somerset Rivers Local Environment Agency Plan

- Local Environment Agency Plan North Somerset Rivers Consultation Report



13. Recreation

Tourism and recreation are important to the local economy. Tourism is particularly important around Weston-super-Mare and along the coast, with many thousands of visitors each year. There are several holiday centres and caravan and camping sites between Portishead and Weston-super-Mare. The beaches at Weston-super-Mare and Sand Bay are particularly well used for bathing. At Uphill the beach is also used for sand yachting and occasional motor sports.

Sailing and yachting are popular recreational activities along the coast with sailing clubs at Portishead, Clevedon and Uphill and moorings at numerous locations. The former Portishead docks redevelopment also offers future opportunities as a marina.

Canoeing is not particularly well provided for within the catchment. However, this is more a reflection of the types of river and their existing uses. As a riparian owner, the Agency permits canoeing at Congresbury on the Yeo. This site is popular with school groups, youth groups and training centres.

Walking and rambling remain one of Britain's most popular pastimes and within the catchment there are many public footpaths. There are some very special walks on the Mendip Hills from Burrington Combe and at coastal locations such as Sand Point and Middle Hope and the coastal footpath between Portishead and Clevedon. Inland there are two routes that link outside the catchment, the Two Valleys Way, (Congresbury to Keynsham) and the Cheddar Valley Railway route. Other routes that make use of Agency owned land are being considered as part of the North Somerset Countryside Strategy. These include a coastal link between Clevedon and Weston-super-Mare and along a number of rivers within the levels area.

Cycling continues to grow in popularity and the catchment also has an extensive cycle network with a combination of on and off-road routes. Horse riding and cycling are combined on a number of the off-road routes and bridle ways.

Angling remains one of Britain's most popular participating sports and within the catchment both freshwater and sea angling takes place. For details of the angling interest see Section 12.2.

There is also a wide range of minority recreational interests that take place in the catchment including birdwatching at various locations along the estuary, on the levels and moors at Blagdon and Barrow Reservoirs.

The Environment Agency owns substantial lengths of river and riparian land within the catchment. This includes land on the Blind Yeo where North Somerset Council manage part of the land holding as public open space. The Agency is producing a conservation and recreation management plan for the Blind Yeo to improve habitat and amenity (see Issue 4.12).

[illegible]

14. Mineral Extraction

The extraction of minerals from quarries, mines and pits can damage underground water resources and rivers and streams. Water is purified as it percolates through aquifers such as Carboniferous Limestone (see Map 3) and surface layers of soil and rock. Removing these materials will reduce the volume of the aquifer, can degrade the quality of water in the aquifer and provide an easy route for pollution to reach groundwater. Water pumped from deep quarries has the potential to modify natural springs and river flows and may be contaminated with silt and mineral salts which may harm the ecosystem in a watercourse. Quarries above the water-table may also impact on the local hydrology. The body of rock removed by quarrying provided temporary storage for groundwater in transit. Its removal may lead to flashier stream and spring flows, and diminish base-flows in summer.

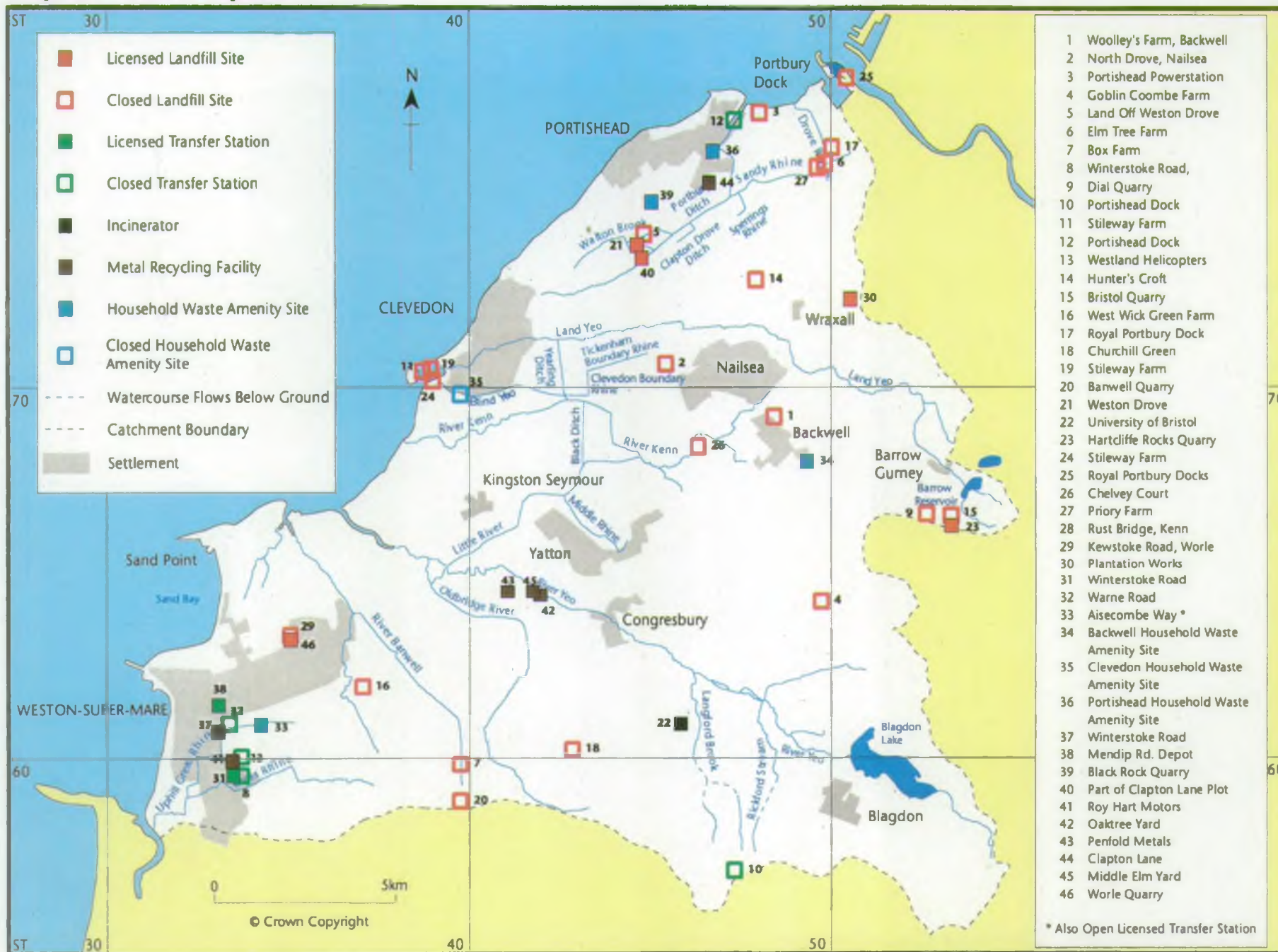
Disused quarries present problems of after-use. Often proposals are made for land-filling with controlled waste (see Section 15) with further potential for pollution.

The mineral extraction sites in the catchment are shown on Map 19.

Map 19 - Mineral Extractions



Map 20 - Waste Disposal



15. The Management of Waste

The Environment Agency regulates the treatment, recovery, storage, movement and disposal of controlled wastes. Controlled waste includes household, commercial, and industrial wastes. It excludes waste from agricultural, mining and quarrying operations although some agricultural and mine and quarry waste may become controlled waste in the near future.

The Government's strategy for sustainable waste management in England and Wales is set out in a White Paper *Making Waste Work*, published in December 1995. This sets out the waste hierarchy:

- Reduction
- Reuse
- Recovery - recycling, composting, energy
- Disposal.

The overall objective is to move the management of waste up the hierarchy thus reducing the volume of waste that is finally disposed to landfill. Landfill, however, will remain as a method of solid waste disposal in the UK for wastes that cannot be recovered and for the residue of some recovery methods such as incineration with energy recovery.

The Agency supports the Government's strategy and will play a key role in achieving more sustainable waste management. A number of targets have been set within the White Paper. Targets include:

- reducing the proportion of controlled waste going to landfill from 70% to 60% by 2005
- recovering 40% of municipal waste by 2005
- to set a target for overall waste reduction by the end of 1998
- recycling or composting 25% of household waste by 2000
- having easily accessible recycling facilities for 80% of householders by the year 2000
- encouraging 40% of domestic properties with a garden to carry out home composting by the year 2000.

Nationally Waste Surveys will be carried out by the Agency providing accurate, consistent data on waste arisings.

Government initiatives to move waste management up the hierarchy include legislative as well as financial incentives. Mechanisms already in place include; the requirement on local authorities to draw up Recycling Plans to detail how recycling targets are to be met, and the Landfill Tax which was introduced on 1 October 1996. The Producer Responsibility Obligations (Packaging Waste) Regulations were introduced in March 1997 placing responsibility on some businesses that handle packaging to recover and recycle certain proportions of packaging materials.

A number of waste management activities are exempt by statute from the requirements for licensing. There are currently 45 specifically exempted activities as detailed in the Waste Management Licensing Regulations 1994, Schedule 3, which include the spreading of industrial waste to benefit agricultural land, certain small to medium scrap yards and a range of construction and recycling activities.

Although not subject to full licensing, these activities are only exempt if there is no risk to the environment or human health, and most are subject to registration by the Agency. Information in the register of exempted activities is available to the public on request.

The Environmental Protection Act 1990 'Duty of Care' provisions apply to any person who handles waste. The system is designed to be self-regulating, placing a duty on all those in the waste chain to properly describe their wastes, keep wastes secure, fully document waste transfers and transfer waste only to an authorized carrier. The original waste producer must also make a reasonable attempt to ensure that the waste is finally dealt with at an authorized waste management facility.

15.1 Waste Arisings

The LEAP area boundary is reasonably similar to the North Somerset Council boundary. The southern and eastern boundaries are slightly different but not to such an extent that the waste figures are invalid. The figures available are for the 1995/96 period, at which time the Local Authority was Woodspring District Council.

15.1.1 Household Waste

The combined total household waste figure of 74,000 tonnes per year comprises waste collected from households by the Waste Collection Authority and those wastes taken by householders to the local Household Waste Amenity sites.

Household waste from the area has been disposed of at the Avonmouth Incinerator in Bristol (which closed in November 1996) and the Walpole Landfill Site at Pawlett near Bridgwater. However, with effect from 1 June 1997, a five year contract has been let by North Somerset Council for the disposal of household waste from their area. Waste is to be taken to T. Adams Ltd site at Yanley Landfill Site under the terms of the contract.

Household waste can be recycled via a number of methods. Excluding home composting, these are:

- 'Bring' or drop off facilities (such as Household Waste Amenity Sites).
- Pre-sorted or post-sorted kerbside collection.

There are two kerbside collection services operating in Nailsea and Worle collecting paper, glass and plastic, which first started as a pilot project in September 1995. Numerous drop-off facilities are available throughout the catchment and these currently number 45 glass, 33 paper, 32 cans, 14 textiles and 4 oil.

These facilities have been successful in recycling approximately 4034 tonnes/year (te/yr) of household materials, comprising of 1487 te/yr glass, 2391 te/yr paper, 76 te/yr cans, 74 te/yr textiles and 507 te/yr oil.

Additionally 365 te of ferrous metal were reclaimed at Avonmouth Incinerator, 130 te of waste by the kerbside collection service, 906 te of other wastes (such as metal, batteries and card) via the Household Waste Amenity sites, approximately 400 te by home composting and 350 te by voluntary groups.

There are three Household Waste Amenity Sites in the area which were established by the former Avon County Council but are now operated by the North Somerset Council. These are due to be operated under a contract with effect from 1st April 1998. Besides providing disposal facilities for household waste and providing recycling receptacles they also provide separate disposal facilities for hazardous household waste. This comprises waste such as asbestos, waste oil, car batteries, gas cylinders, DIY and garden chemicals. All of these wastes could cause harm to health or pollution of the environment if disposed of incorrectly.

15.1.2 Private Sector

Within the catchment approximately 137,672 tonnes of industrial and commercial waste was dealt with at a range of licensed facilities.

This comprised 113,764 tonnes of inert/demolition waste, representing 83% of the total. The majority of this waste type (89%) was disposed of at the Hartcliffe Rocks Landfill site near Felton.

In response to Government initiatives to make waste management more sustainable many companies are looking to minimize the amount of wastes they produce. Additionally, the introduction of the 'landfill tax' in October 1996 has also encouraged industry to find ways of reducing waste output. The rates of tax are currently set at £2/tonne for inert wastes and £7/per tonne for other wastes, therefore savings can be considerable.

15.2 Waste Management Sites

There are 20 operational licensed waste management facilities within the catchment and 31 closed licensed facilities (see Map 20).

There are no major active household/commercial/industrial waste landfill facilities within the catchment. Of the 7 landfill sites, 4 are licensed to accept solely inert wastes. Two of the other 3 sites are substantially completed and the third site has remaining capacity but has recently applied for an extension of time to the planning permission which has expired. The void space remaining at these sites is 212,000 m³ as at 1 April 1997.

One of the transfer stations which is operated by Quadron Services Ltd is for the sole use of the licence holder who is involved in house, highway and grounds maintenance. A wide range of wastes are handled at the other two sites one of which is operated by the Local Authority. Some 55,000 te of household and trade waste were dealt with at the Local Authority Transfer Station during 1995/96. All three transfer stations are situated in Weston-super-Mare.

The Local Authority operate three Household Waste Amenity Sites within the catchment. Two operate on a 'satellite' basis within the third sited at the same location as the main transfer station in Weston-super-Mare.

There are six metal recycling centres within the area which hold waste management licences.

There are records of incidental randomly situated 'fly-tipping' within the area which does not cause any particular problems.

Reference has been made to activities exempt from waste management licensing. Of the 156 registered in this area, 49 (31%) are for recycling activities and a significant 25% are for the storage of medicines, medical, nursing or veterinary wastes at premises such as pharmacies.

15.3 Waste Planning

Strategic aspects of waste disposal in the catchment will be defined in plans produced by the Local Authority. A Waste Local Plan which deals with geographical, population and planning issues will eventually be produced by the North Somerset Council covering most of the catchment. Prior to the abolition of Avon County Council on 1st April 1996, the Council succeeded in finalising their Waste Management Plan (as required by Section 50 of The Environmental Protection Act 1990). This stands as a valuable source of information to the local authority and industry alike. It will assist the successor authority to develop sustainable and economic waste management systems for meeting local demands and offer clear guidance when preparing their statutory Waste Local Plans.

The Waste Management Plan produced by Avon County Council in March 1996 is available at all local libraries and a limited number are still available from the Environment Agency North Wessex Area Office in Bridgwater.

16. Contaminated Land

The Environment Act 1995 contains new provisions for dealing with contaminated land; local authorities are the key regulators under the Act with the Agency acting as a consultee and advisor. The new provisions will be enacted in 1998 and will define contaminated land as any land which appears to a local authority to be in such a condition - because of the substances it contains - that water pollution or significant harm is being, or is likely to be caused. This interpretation is subject to

guidance issued by the Secretary of State. Local authorities will be required to carry out a survey to identify contaminated land in its area. When these surveys have been carried out we have a duty to prepare and publish a report on the state of contaminated land from time to time, or if specifically requested to do so by the Secretary of State. Some sites may be designated as 'special sites'; these will become our responsibility. Special sites include those which are, or are likely to, cause serious water pollution, because of the substances in or under them. It is made clear in the draft Statutory Guidance that contaminated sites should continue to be remediated wherever possible on a voluntary basis or through the normal development planning process. Existing pollution legislation can also be used in some circumstances.

17. Flood Defence and Land Drainage

17.1 Flood Risk and Development

In accordance with *DETR Circular 30/92 Development and Flood Risk* we advise planning authorities on flood defence matters. We also issue consents and byelaw approvals for certain works which are likely to affect the flow of water or impede any drainage work.

We have complete hydrological models of all main rivers within the catchment and a hydraulic model of the River Banwell. These computer models are available to determine the effects of urban development and to develop appropriate drainage policies for surface water disposal.

Future development proposals within North Somerset are concentrated primarily within and around existing urban areas (see Section 18).

Development of the Royal Portbury Dock hinterland into the primary car import centre for the UK has been taken forward in conjunction with new tidal defences and an agreed environmental strategy which protects the indigenous wildlife by the provision of landscaped corridors to the drainage rhines within the site. The area is important for its population of Long, and Short Eared Owls.

A considerable part of the catchment is at risk from flooding, see Map 21, and require river or tidal defences or both. The levels of flood defence provided by the Agency are shown in Table 9. Tidal defence is to a 100 year standard over the great majority of our sea defences. Fluvial defence is at a minimum standard of 50 year protection in urban areas, with the majority at 100 year protection. We will object to development proposals behind existing flood or sea defences where those defences are not an appropriate standard for new development unless the developer agrees to pay for the provision of new defences or the uprating of existing defences (see Issue 4.1).

17.1.1 Flood Surveys

The DETR requires the Agency to carry out flood surveys which identify indicative floodable areas. These surveys enable the Agency to influence development in a positive way in accordance with the Government's plan-led approach.

The Agency produced indicative flood maps for all main rivers within the South West Region. These flood maps will be made available to all local planning authorities by early 1998. From 1997-2000 the Agency will produce computer modelled floodplain maps for 'hot-spot areas' i.e. those areas allocated within the plan process for development.

17.2 Maintaining River and Flood Defence Structures

We maintain rivers and flood defence structures to reduce the risk of flooding (see Map 21 for main structures). This work involves routine maintenance to control aquatic and bankside weed and keep channels clear for drainage and irrigation. Less frequently, rivers are dredged to remove silt and major channel obstructions such as fallen trees. We have powers under the Water Resources Act 1991, the Land Drainage Act 1991, and the Environment Act 1995, to maintain and improve watercourses designated by the Ministry of Agriculture, Fisheries and Food as main river for the efficient passage of flood flow and the management of water levels (see Map 22 for main rivers in this catchment). Three

Map of the Somerset Levels and Moors showing the Somerset Coast Flood Defence Scheme.

Legend:

- Main Sluices
- 1 Drove Rhine Tidal Gate
- 2 Middle Bridge Sluice
- 3 Blind Yeo Sluice
- 4 New Bow Sluice
- 5 Tutshill Sluice
- Land at Risk of Flooding
- Watercourse Flows Below Ground
- Catchment Boundary
- Settlement

Geographical Features and Labels:

- Coastline:** Mouth of the Severn, Sand Point, Sand Bay, Weston-Super-Mare.
- Settlements:** Portbury, Clevedon, Nailsea, Backwell, Barrow Gurney, Blagdon, Congresbury, Yatton, Kingston Seymour.
- Watercourses:** Drove Rhine, Sandy Rhine, Speyns Rhine, Claptonmore Ditch, Portbury Ditch, Walton Brook, River Kenn, River Yeo, River Tor, Oldbridge River, River Barwell, Langford Brook, River Tor, Blagdon Lake, Barrow Reservoir, Woodspring Bay.
- Other Features:** Land Yeo, Lickenham Boundary Stone, Clevedon Boundary Stone, Backwell Ditch, Middle Bridge, Sand Bay, Sand Point.

Scale: 0 to 5 km. **Copyright:** © Crown Copyright.

Internal Drainage Boards (IDBs) (see Map 22) maintain the drainage and irrigation networks in their areas. On main and non-main rivers riparian owners must carry out maintenance. On non-main rivers local authorities are responsible for flooding matters. In IDB areas the IDBs have general duties of supervision.

We try to focus our work where it is needed most. By the year 2000 we will be working out how best to concentrate our efforts using the Flood Defence Management System (FDMS) (see Issue 4.6).

17.3 Flood Warning

Absolute flood protection is not possible. Because of this we need to warn people when there is a danger of flooding. We took over the role of warning the public and other organizations of likely flooding from the police on 1 September 1996. We have developed communication systems and aimed at providing flood warnings to those members of the public most at risk. We have a strategy which details how the procedures operate, called the Flood Warning Dissemination Plan for Somerset and Avon areas, a copy is held in the Area office for public inspection.

Flood warnings are issued for the following rivers:

Table 8 Flood Warnings Issued

RIVER/COAST	LOCATION/STRETCH	WARNINGS ISSUED
River Warnings River Yeo	Wrington to Congresbury	Yellow, Amber, Red
Tidal Warnings Coast - Somerset coast* - Somerset coast*	Porlock to Avonmouth At Uphill At Weston-super-Mare At Sand Bay At Wyke St Lawrence At Clevedon At Portishead	Yellow, Amber, Red Yellow, Amber, Red Yellow, Amber, Red Yellow, Amber, Red Yellow, Amber, Red Yellow, Amber, Red Yellow, Amber, Red

* Warnings may be issued collectively along the whole Somerset/Bristol channel coast and described by the stretch "Porlock to Avonmouth" or individually to locations, as listed above, depending on what locations are forecast to be at risk at the time.

Warnings are issued by direct contact and via local radio. Recorded information on current flood warnings is also provided. Leaflets are also available from Agency offices which fully explain the flood warning service.

17.3.1 Flood Warning Improvements

A study of the level of service for flood warning is currently being carried out to determine whether the required standard is met; it is expected to be complete by April 1998. The results will identify additions and other changes to the flood warning service.

17.4 Improvements

We can build new flood defences if flooding is a serious problem in a particular area. Nowadays we usually only build new defences to protect existing built-up areas from flooding. All schemes must be technically, economically and environmentally sound. We keep a list of schemes called a Programme of Capital Works which helps us to plan for the future.

The map illustrates the River Sever catchment area in Somerset, England. The River Sever is shown flowing from the south towards the north, where it meets the Mouth of the Sever. The catchment area is divided into three IDBs: Gordano Valley IDB (green), North Somerset IDB (yellow), and West Mendip IDB (brown). The map also shows the locations of several settlements, including Portbury, Clevedon, Kingston Seymour, Nailsea, Backwell, Yatton, Congresbury, and Blagdon. The River Sever is shown flowing through the North Somerset IDB, with its tributaries including the River Kenn, River Yeo, River Taw, and River Tone. The map includes a legend, a scale bar, and a north arrow.

Different types of land and property need different levels of protection (see Table 9). We use the following indicative standards (return period in years) to design schemes:

Table 9 Standards of Service Land Use Bands and Targets

Land use band	Description of typical land use	Target standard of protection (return period)	
		Fluvial	Saline
A	Urban	1:50-1:100	1:100-1:200
B	Lower density urban	1:25-1:100	1:50-1:200
C	Isolated rural communities	1:5-1:50	1:10-1:100
D	Isolated properties/intensive farming	1:1.25-1:10	1:2.5-1:20
E	Low grade agricultural land	<1:2.5	<1:5

Please refer to Issues 4.2 and 4.1 where we have identified flood problem locations in the North Somerset Rivers Catchment.

17.5 Shoreline Management Plans

The aim of a Shoreline Management Plan (SMP) is to provide the basis for sustainable coastal defence policies and to set objectives for the future management of the shoreline. These Plans are being drafted by coastal cell groups of which the Agency is a member.

Two SMPs cover the coast for the North Wessex Area; north of Brean Down is the Severn Estuary SMP whilst south of this point is the Bridgwater Bay to Bideford Bay SMP. (See Severn Estuary Strategy Joint Issues Report). The Severn Estuary SMP covers the coastline for this LEAP area. By the end of 1998 a draft SMP is planned to be produced, this will subsequently be adopted by the coastal group members.

17.6 Water Level Management Plans

The need for Water Level Management Plans (WLMPs) is identified by MAFF in their procedural guide published in 1994. They advise that "Water Level Management Plans provide a means by which the water level requirements of a range of activities, including agriculture, flood defence and conservation can be balanced and integrated".

The Agency is identified by English Nature as the primary operating Authority for the Gordano Valley Area and is leading the production of the WLMP for this area. For the remainder of the area the Internal Drainage Boards are leading the production of WLMPs and the Agency is a major contributor.

Map 23 - Built Environment and Development



18. Development and the Environment

The Agency has a duty to make a contribution to sustainable development (see Section 2.1.2). We can assist local authorities to allocate land for development by commenting on local plans, identifying constraints and highlighting where the environment can be enhanced by sympathetic development. In 1994 the NRA published guidance notes for local planning authorities on ways of protecting the environment through development plans. The Agency is currently updating these guidance notes to cover the full range of our responsibilities.

The North Somerset Rivers Catchment is almost entirely within the boundary of North Somerset Council (see Map 23). North Somerset came into being in 1996 as a Unitary Authority with the disbanding of Avon County. A small part of the catchment lies within the administrative boundaries of Bath and North East Somerset (another newly created Unitary Authority) and Mendip District Council.

The current Structure Plan for the North Somerset part of the catchment is the Avon County Structure Plan incorporating Adopted Third Alteration adopted in 1994, this covers the period from 1989 to 2001. The Plan sets out provision for, amongst other things, housing and employment allocating 10,450 dwellings and 175 ha of employment land over the Plan period for the North Somerset area.

The new Unitary Authorities that made up the former County of Avon have set up a Joint Technical Unit to produce a Joint Replacement Structure Plan. A Green Paper for consultation was produced in March 1997 as a first step along this process. The emphasis of this paper has moved sharply towards sustainability in line with Government guidance.

Detailed planning policies are contained within Local Plans. These identify areas which are suitable for development and provide policies to address issues such as contaminated land, flooding, water pollution and safeguarding the environment. The primary plan covering the catchment is the Woodspring Local Plan Deposit Version 1994, this is currently being assessed by a government appointed inspector who ran the inquiry into the Local Plan. It is anticipated that the Plan will be adopted in late 1998 immediately after which work will commence on the North Somerset Local Plan to cover the period up to 2011.

Table 10 Local Plans Covering the North Somerset Rivers Catchment

District	Population in catchment	Plan	Notes on planned development
North Somerset (formerly Woodspring)	174,000 approx	Woodspring Local Plan Deposit Version 1994	The catchment is dominated by the conurbation of Weston-super-Mare and it is here that the major residential and employment commitments are. A further 3,000 homes remain to be built within the Plan period at Weston-super-Mare. Approximately 90 ha of employment land remains to be committed
Mendip	1,000 approx	Mendip Hills Local Plan (Prepared by Somerset County Council)	Negligible development proposed in keeping with designated status
Bath and North East Somerset (formerly Wansdyke)	3,000 approx	Wansdyke Local Plan (with inspector)	Negligible development proposed

Population growth within North Somerset Council area was expected to reach 192,424 assuming full take-up of allocated sites, but, take-up has fallen behind anticipated rates and population estimates need to be adjusted accordingly.

19. Water Abstraction and Supply

Water is abstracted within the North Somerset Rivers Catchment for public water supply and for private water use, including the supply of water for general agriculture, spray irrigation, private water supply, commercial, industrial, leisure and fish farming. All of the public water supply abstractions and many of the private abstractions are licensed by the Agency. Details of the water resources situation are described in the South West Regional Water Resources Strategy document "Tomorrow's Water", but the local situation is described below.

On average the total quantity of water theoretically available in the North Somerset Rivers Catchment is 107606 Ml/year. This water represents the proportion of rainfall not evaporated or taken up by plants.

Table 11 Groundwater Abstractions

	Number of licences (as of 4/7/97)	Volume megalitres per day (annual authorized/365)	Percentage of total	*Proportion consumed (%)
General farming	25	0.32	0.76	25
Spray Irrigation	7	0.33	0.79	100
Private Water Supply	4	0.14	0.33	25
Industry	3	1.16	2.76	30
Public Water Supply	6	39.95	95.07	100
Commercial	3	0.11	0.26	30
Leisure	2	0.01	0.03	30
TOTAL	50	42.02	100.00	

* Note: Removed from source and not returned to same catchment

Table 12 Surface Water Abstractions

	Number of licences (as of 4/7/97)	Volume megalitres per day (annual authorized/365)	Percentage of total	Proportion consumed (%)
General farming	1	0.02	0.06	25
Spray Irrigation	8	0.20	0.60	100
Industry	3	0.01	0.01	30
Fish Farming	4	6.56	19.50	0
Public Water Supply	4	26.85	79.83	100
Commercial	1	0	0	30
Leisure	1	0	0	30
TOTAL	22	33.64	100.00	

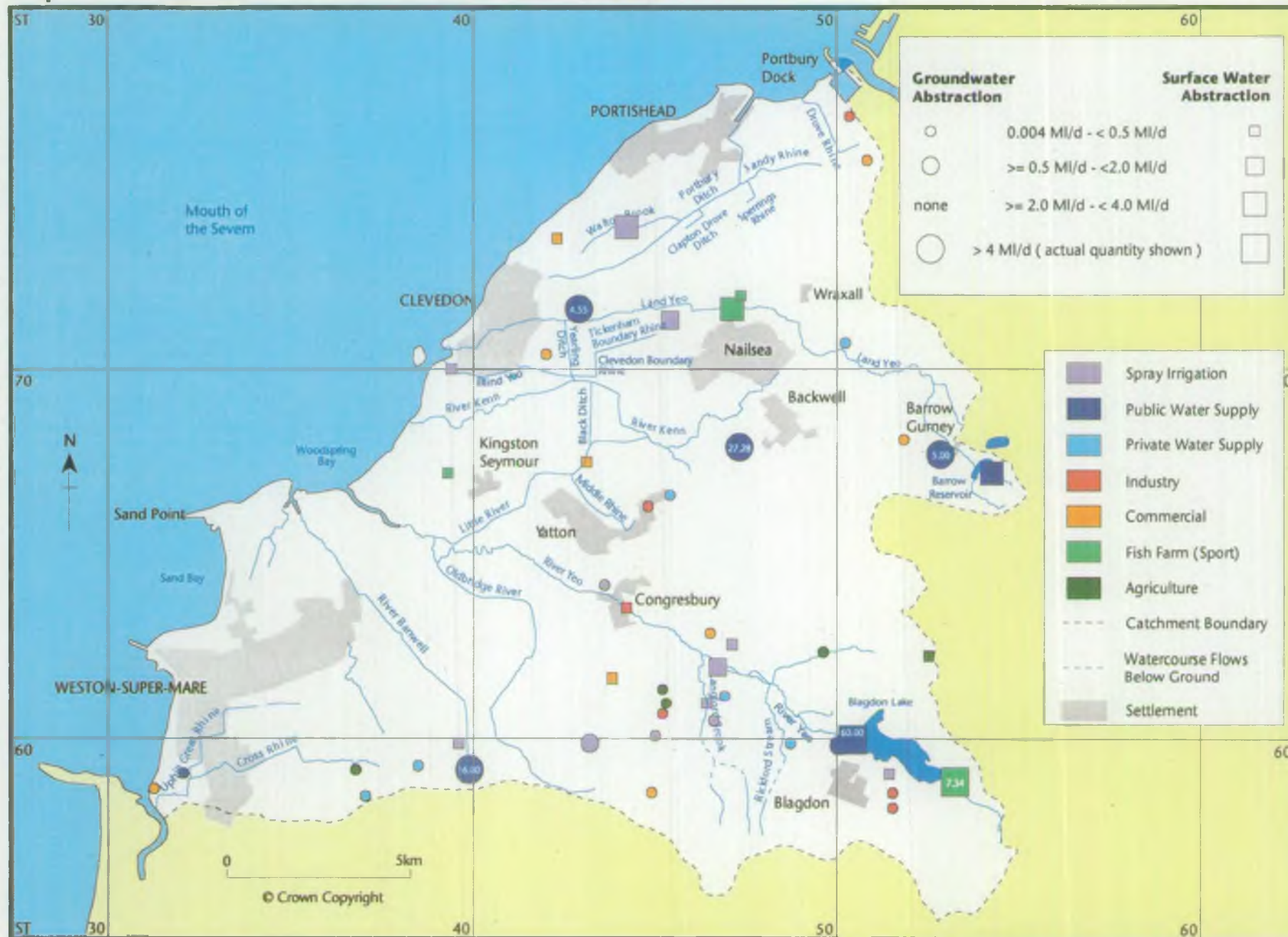
The above tables and Map 24 show that abstraction for public water supply represent the largest proportion of the total abstraction within the catchment, followed by industry and fish rearing.

The total volume licensed for abstraction represents 64% on average, of the total available natural resource. However, this is a distortion of the actual resource consumption. In reality many abstractors take less than their authorized quantity and abstracted water is often returned to the catchment and is available for re-use.

Licensed abstractions fall into the two categories of consumptive and non-consumptive use. Consumptive uses involve the loss of some of the water abstracted, for example all the public water supply and spray irrigation abstractions are consumptive. Non-consumptive uses return most of the abstracted water back to the catchment close to the point of abstraction e.g. fish farms. Consumptive uses have potentially more impact on rivers than non-consumptive, though the latter can have local impacts depending on the rates of abstraction and local conditions.

Consumptive uses account for 96% of groundwater and 83% of surface water annual authorized abstraction volume. The majority of consumptive use abstraction volume is accounted for by the public water supply sources.

Map 24 - Surface Water and Groundwater Abstractions



19.1 Public Water Supply

Abstractions for public water supply represent 86.5% of the total annual licensed volume in this catchment. The sole provider of supplies to the catchment is Bristol Water.

The current water supply demand across the whole of the area Bristol Water supply represents 310 MI/d on average. Approximately 110 MI/d is supplied to the company's southern zone of which this catchment is part.

Main demand centres include those adjacent to the Bristol Channel, Weston-super-Mare, Clevedon and Portishead and further inland Nailsea, Yatton and Congresbury.

The sources available to Bristol Water in the catchment are used to meet local demands, with Banwell Spring being the main source of supply for Weston-super-Mare. These local sources are supported by Blagdon reservoir and imports of water into the catchment from Chew Valley Lake, Cheddar Reservoir and if necessary from the River Severn via the Gloucester and Sharpness canal and Purton water treatment works.

There are eight public water supply licences within the catchment with a total annual authorized abstraction of 22382 MI, these are shown in Table 13 and Map 24.

Table 13 Public Water Supply Authorized Abstractions

Source	Daily Licensed Quantity (MI)	Annual Licensed Quantity (MI)	Comments
Banwell Spring	16	4850	Subject to a flow condition of winter - 13.2 l/sec and summer 26.2 l/sec downstream of the source
Blackdown Springs, Shipham	0.59	100	Standby source, principal source is at Cheddar; combined quantities from this source and principal source shall not exceed quantities authorized for the principal source
Blagdon Spring	1.6	432	
River Yeo Blagdon Reservoir Upper Langford Stream Rickford Stream	60	9000	Licence provides for a compensation water release into the River Yeo below Blagdon reservoir: Abstraction linked to flow condition at other two sources
Cold Bath Well	5	1000	Not in use due to possible landfill leachate contamination (see Issue 4.7)
Clevedon	4.55	1200	
Chelvey Well	27.28	5000	Abstraction linked to flow condition at Kenn Gate of 56.7 l/sec
Dundry - Elwell Streams	No daily rate specified	800	See Issue 4.11

A factor which must be considered when establishing the current status of the catchment as a source of public water supply is the reliable yield available from individual sources of supply. Although an abstraction licence authorizes the licence holder to abstract up to a maximum quantity of water, it may not be possible to abstract this all year due to physical and operational constraints. The *reliable yield* of a source is the theoretical amount of water that can be physically abstracted during critical dry periods. Discrete sources within the catchment have a reliable yield of approximately 24 MI/d, this is backed up by the Mendip reservoirs together with associated sources, within and outside of the catchment area, which can reliably supply 90 MI/d. Bristol Water's total reliable yield is in the order of 361 MI/d. These reliable yield figures have been reduced by 2.5% to allow for outage. This is an operational allowance for planned and unplanned events which results in the source being temporarily inoperable.

Demand in the Bristol Water supply zone is expected to increase from 310 MI/d to 427 MI/d by 2021 assuming a high growth rate and 1992 levels of demand management and 380 MI/d under a low forecast where demand management and leakage control are encouraged. Comparing these forecasts to the current reliable yield of 361 MI/d indicates that in 2021 under the high growth rate scenario there will be a deficit of 66 MI/d and under the low growth rate scenario a deficit of 19 MI/d. Bristol Water are currently reviewing yields and demands and revisions to these figures are likely.

These figures have been adjusted to take account of existing legal obligations to provide bulk supplies of raw water to ICI and Wessex Water.

The Agency will adopt a staged approach whereby we will ensure that all appropriate demand management, leakage control and resource management options as outlined in *Tomorrow's Water - Regional Water Resource Development Strategy* are actively pursued before considering the development of new resources.

If despite measures to use existing resources more efficiently, new resources are required, improved conjunctive use of existing sources is another option e.g. a pumped storage scheme for Chew Valley Lake. The first phase would provide an additional yield of 55 MI/d without an increase in the top water level of the lake. Other options highlighted in *Tomorrow's Water* include enlargement of Chew Valley by raising of the water level and further imports via the River Severn. Raising water levels in Chew Valley Lake would have considerable environmental implications given the SSSI designation of the reservoir. Detailed environmental assessment would be essential prior to making a decision on the feasibility of this option.

19.2 Private Water Use

Predictions of future growth in non-public water supplies are more difficult to assess than those for public water supply. Water use is influenced by a number of environmental, political, economic and commercial factors.

The Agency must have regard to the reasonable future needs for water for private abstractors. Nationally derived growth rates for future private abstraction demand are outlined in *Tomorrow's Water*. Using the rates specified, the net commitment to private licensed abstraction in the catchment in the year 2021 would be 9.24 MI/d compared to the current net commitment of 8.85 MI/d. Future abstraction needs will be addressed through the abstraction licensing procedure.

20. Aqueous Discharges

The Environment Agency regulates the disposal of liquid effluent direct to surface or groundwater by issuing discharge consents or Integrated Pollution Control authorizations in some cases (see Section 23).

Discharges which have the greatest potential to affect the quality of the water environment have numeric concentration limits attached to their consents. These limits may apply to individual or groups of substances and are set at levels needed to protect the environment from harm and ensure compliance with River Quality Objectives, EC Directives and International Conventions (see Section 6).

The following EC Directives affect the control of aqueous discharges in this catchment. For more information see Sections 6.3 to 6.8:

- EC Bathing Water Directive (76/160/EEC)
- EC Dangerous Substances Directive (76/464/EEC)
- EC Freshwater Fish Directive (78/659/EEC)
- EC Urban Wastewater Treatment Directive (91/271/EEC)
- EC Surface Water Abstraction Directive (75/440/EEC).

Discharge consents can only be used to control point source discharges. Consented discharges can be broken down into the following types:

- Continuous e.g. sewage works
- Intermittent e.g. sewer overflows
- Discharges to ground e.g. soakaways

Diffuse sources of pollution such as agricultural runoff and much urban/highway runoff has to be tackled using other regulatory powers.

20.1 Continuous Discharges

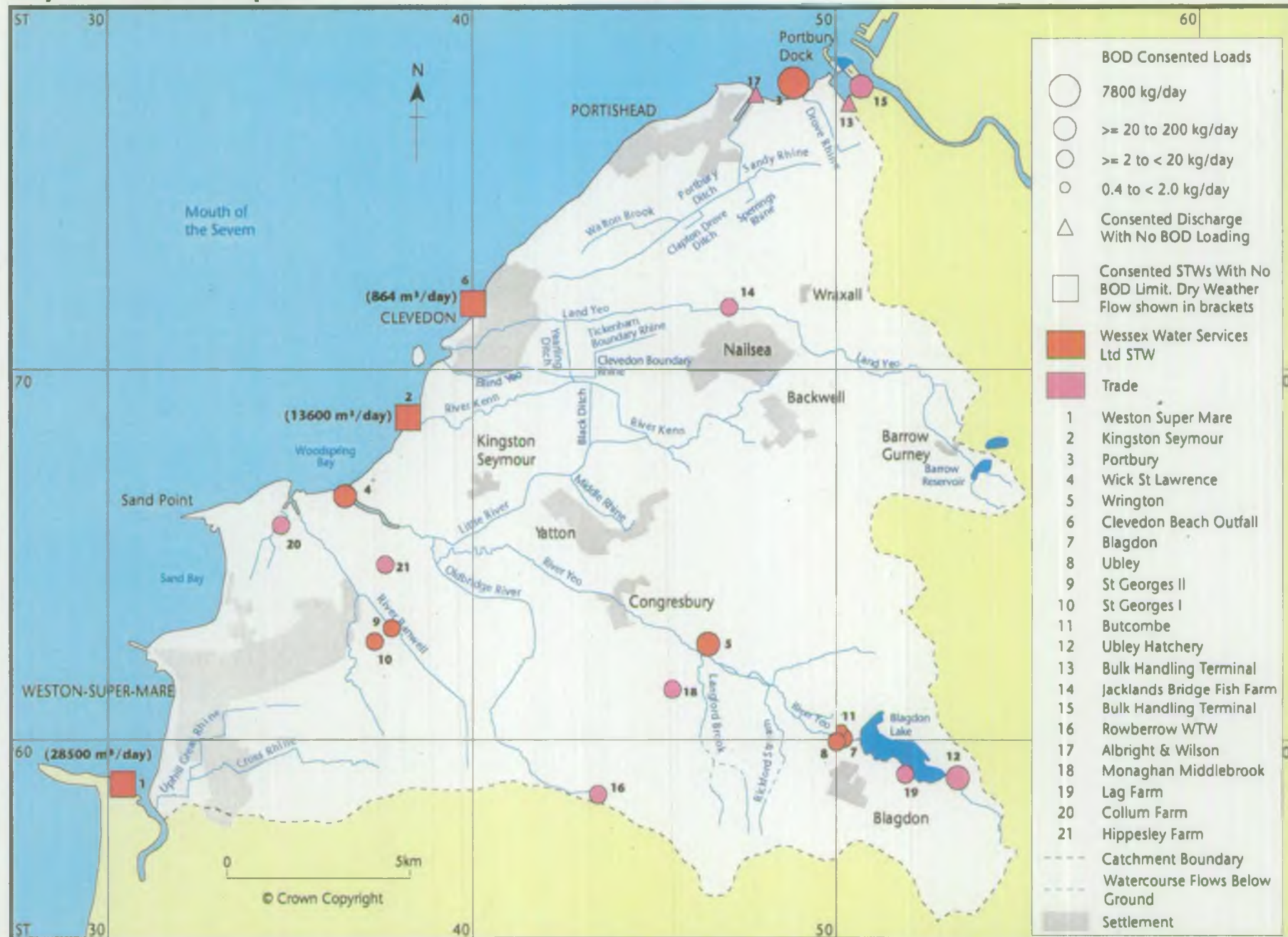
20.1.1 Treated Sewage

In areas served by mains sewerage both trade effluents and sewage are normally treated at the local sewage treatment works (STW). In this area, the sewerage undertaker is Wessex Water Services Ltd, which operates 11 STWs (see Map 25).

As can be seen from Map 25 the major STWs are all coastal, and discharge to the Severn Estuary. The impact of their discharges including EC Bathing Water Directive Compliance is dealt with in the Severn Estuary Joint Issues Document - May 1997. Any issues and actions will be covered by the Agency's own Severn Estuary Action Plan to be produced in 1998 jointly by South West, Midland and Welsh Regions.

The largest STW is Weston-super-Mare which is currently the subject of major improvement works, in order to comply with the Urban Waste Water Treatment Directive and the Bathing Waters Directive. Secondary treatment and ultraviolet disinfection will be used to treat the sewage. A consent application is currently being determined for the new works. The load on this works varies with the seasons as there is a high concentration of caravan parks and other holiday accommodation in the area.

Map 25 - Effluent Disposal



Next in order of size are the STWs at Kingston Seymour and Portbury. Kingston Seymour treats flows from the Clevedon area and Portbury treats flows from Portishead. Both Kingston Seymour and Portbury Wharf will be providing secondary treatment by early 1999 and Kingston Seymour will be using ultraviolet disinfection by the end of 1999. Whilst the Clevedon Beach Outfall still has a valid consent, discharges are no longer made at this point and we are pursuing a revocation.

There are no substantial private STWs in the LEAP area.

20.1.2 Water Company Investment Plans (AMP2 and AMP3)

AMP2 is the investment programme agreed between the water companies and regulators. The investment period was originally intended to run from 1995 to 2005 though an interim review is going to be carried out and AMP3 will enter into force in 2000 for a ten year period.

Within the North Somerset Rivers Catchment, Wessex Water are committed to improving Portbury and Kingston Seymour STWs. Secondary treatment will be provided at these works in line with the requirements of the Urban Waste Water Treatment Directive.

20.1.3 Trade Effluents

Most trade effluents are discharged to the catchment via STWs; there are few major consented trade discharges (see Map 25). The largest is from Ubley Hatchery, a Bristol Water Plc owned fish farm which is consented for a range of materials, including phenols and copper. The two discharges from the Bulk Handling Terminal at Portbury Dock comprise of drainage from the quay area. The smaller volume consent contains an iron limit. The discharge from Monaghan Middlebrook is derived from mushroom production and includes a total pesticides limit (see Issue 4.9).

Albright and Wilson's site drainage at Portishead is covered by a consent although the site has ceased operation.

20.2 Intermittent Discharges

These include sewer storm overflows and sewage pumping station emergency overflows. These are mainly associated with urban areas as are discharges of contaminated surface runoff.

During heavy storms, large volumes of oily water can be generated by runoff from car parks and industrial estates. The Agency carries out pollution prevention visits and surveys to identify such problems and encourages developers to install oil interceptors wherever possible.

20.3 Discharges to Ground

Remote properties and small villages are not usually connected to mains sewer. Septic tanks discharging to ground soakaway systems as well as small treatment plants and sealed cesspools are used instead. Pollution problems in local ditches, streams and groundwater aquifers can result, if soil conditions are unsuitable e.g. very heavy clay or very permeable sand. Large parts of the North Somerset Rivers Catchment are level, low-lying clay ground and soakaway problems are widespread e.g. around Puxton and Brinsea. The opposite situation is encountered high in the Mendips where the subsoil and bedrock can be very fast-draining due to the underlying fissured limestone. This can increase the risk of groundwater contamination.

21. Aquaculture

In this catchment there are 2 consented fish farms, Jacklands Bridge Fish Farm at Nailsea and the Bristol Water Plc operated Ubley Hatchery, just upstream of Blagdon Lake (see Map 24 and Map 25). Fish farms require both an abstraction licence and a consent to discharge.

22. Farming and Forestry

22.1 Farming

Agriculture in North Somerset is dominated by the levels and moors, as highlighted in earlier sections. Despite the pressures for development south of Bristol on the higher ground not subject to flooding 71% (26,913 ha) of the land is farmed compared with the national figure of 81%. Of this, a large proportion (82%) is grassland and rough grazing.

Table 14 Land Use Type

Land Use Type (1995 MAFF)	%
Grassland < 5 years old	12
Grassland > 5 years old	65
Rough Grazing	5.2
Crops & Fallow	12.6
Farm Woodland	2.3
Other Land	1.6
Set-Aside	1.4

The catchment is predominantly Grade 3 land, the grassland supporting specialist dairy, beef and sheep farms with limited arable. The dairy herd in the catchment stands at approximately 12,000 head, a fall of 28% in the 10 years since 1985. This is reflected in a 33% decrease in the number of dairy farms in the same period. The MAFF pre BSE figures also show an 84% increase in the number of beef and sheep holdings, with the beef herd up by 140% and the sheep flock up 34%. There have been no significant changes in the number of specialist pig and poultry units, but their stock numbers are down by 26% and 24% respectively.

Within the arable sector, the area of cereals has decreased by 27% over the past 10 years, but this is counteracted by the increasing popularity of forage maize for cattle feed and oilseed rape. There has also been a significant increase in the number of horticultural holdings.

22.1.1 Farm Problems

On the flood prone moors traditional farming practices developed to accommodate these circumstances. It is only relatively recently, since the construction of arterial drainage schemes and the advent of more suitable machinery, that large scale intensification of grassland management has been possible. More arable crops can also be grown. Intensive use of modern farming methods can create risks of pollution and soil loss.

The Agency works with organizations such as the Ministry of Agriculture, Fisheries and Food (MAFF) and Farming and Wildlife Advisory Group (FWAG) and the North Somerset Levels and Moors Project to encourage farmers to adopt more environmentally-friendly farming practices.

The following types of problem may occur either chronically or occasionally:

- Livestock farms can be a source of pollution which arises from cattle slurry, milking parlour washings and silage effluent. However, recent investment in waste storage and handling facilities, largely supported by MAFF grant aid, has led to a significant reduction in the number of point source polluting discharges.

Environment Agency and MAFF officers give advice to farmers as a contribution to the production of their Farm Waste Management Plans, but with the withdrawal of grant aid for pollution control other than in NSAs/NVZs it may prove difficult to encourage farmers to invest in such non-income generating capitals works.

- Runoff from riverside fields, especially after ploughing and fertilizer application, often contains high levels of plant nutrients, particularly nitrate and phosphate. This may give rise to nutrient enrichment in the watercourse, leading to excessive plant growth and more frequent algal blooms (eutrophication). The creation of uncultivated strips of land next to the river - buffer strips - can help to reduce the amount of silt and fertilizer runoff entering the watercourse. We have recently published a booklet called "Understanding Buffer Strips". It explains types of buffer, their benefits and role in reducing pollution.
- Habitat loss is often a result of intensive farming e.g. by the removal of hedges, ploughing too close to watercourses and removal of scrub vegetation. Recent legislation limiting hedgerow removal will undoubtedly reduce this problem, thus maintaining the relatively small fields characteristic of North Somerset.

Under the Countryside Stewardship Scheme and the proposed MAFF Habitat Scheme payments may be available to manage waterside land in a way sympathetic to wildlife (Buffer Strips). Set-aside land can also provide environmental benefits.

- Soil erosion - from sloping cultivated fields, particularly after ploughing and on sloping land in periods of intense rainfall. This increases the silt loading of the river and can lead to problems with the concretion of river bed gravels, the reduction of light for river plants and deleterious effects on fish and invertebrates. Soil erosion is increased by hedge removal which often accompanies arable farming and is therefore not a particular problem in this catchment.
- Pesticides - arable cultivation often involves ploughing right to the river bank top, and the flailing of bankside vegetation. The lack of a buffer strip between arable land and watercourse can lead to pesticide residues being washed into rivers.
- Groundwater may be polluted by fertilizer or pesticides at those farms which overly aquifers.
- Horticultural enterprises often require spray irrigation which may deplete surface water resources in the summer months when river flows are likely to be low.

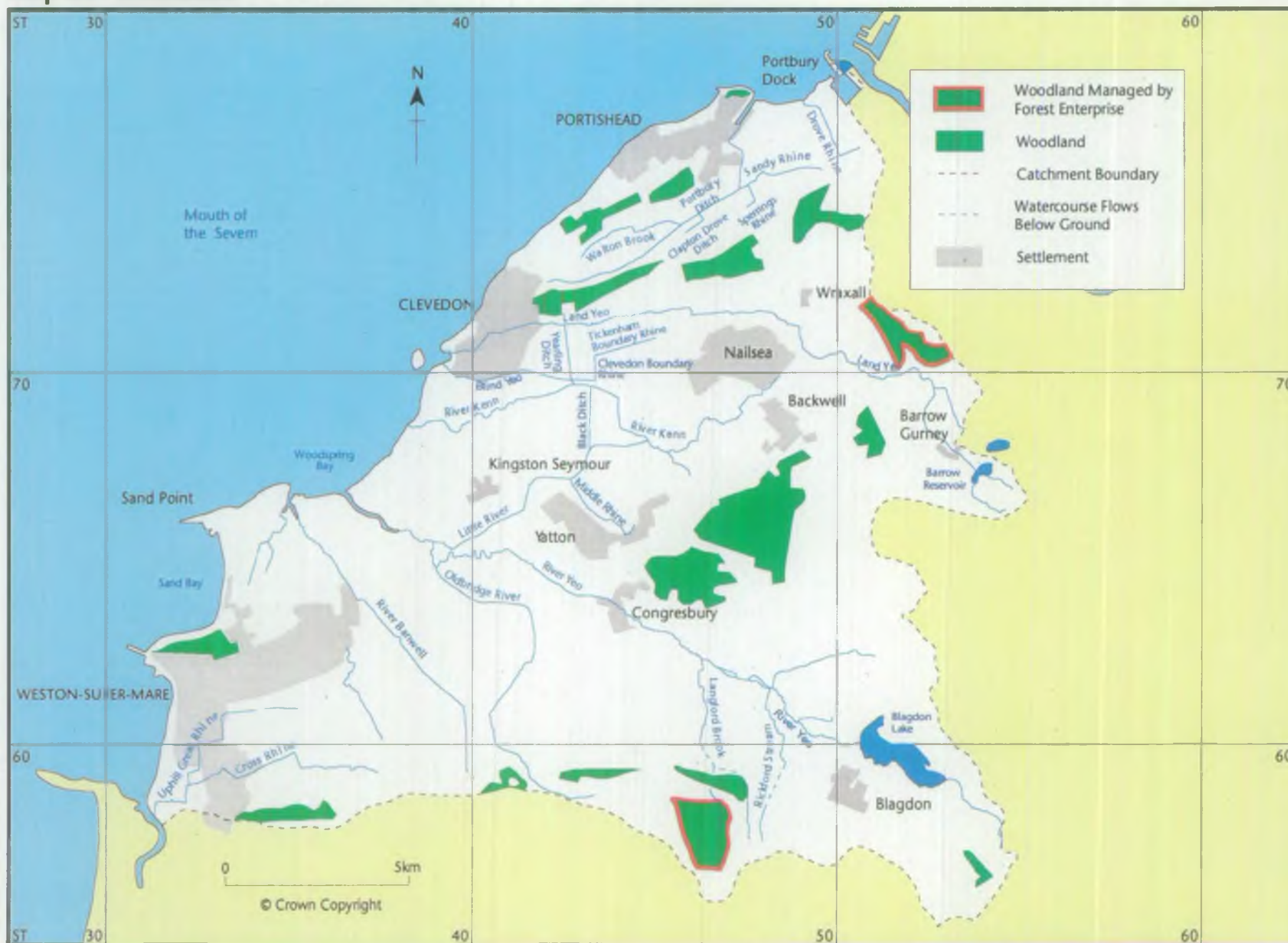
Farmers are also encouraged to follow advice published in the free MAFF Codes of Good Agricultural Practice for the Protection of Water, Soil and Air and take advice from the Avon Farming and Wildlife Advisory Group. Where farm pollution is known to have caused non-compliance with River Quality Objectives this is dealt with in Section 6.2 and Issue 4.8.

22.2 Forestry

Well managed woodland in the right places does not harm the water environment and will often bring benefits. However, in some circumstances woodland planting and management can cause problems. Acidification, soil erosion, pollution, water yield, increased flood risk and damage to wildlife habitats concern us in some parts of England and Wales but in the Agency's South West region the planting and management of new woodland does not usually cause problems for the water environment.

The Forestry Authority regulates forestry in the UK by licensing some operations using felling licences and providing grant aid through the Woodland Grant Scheme. The Forestry Authority has published a series of guidelines on forests and water, nature conservation, landscape design, archaeology and recreation. The Guidelines encourage environmentally sympathetic planting, management and harvesting. The Farm Woodland Premium Scheme operated by MAFF also provides grant aid for new woodlands on farms.

Map 26 - Woodland



Special incentives are available for woodland creation within the Community Forest through the Forest of Avon and the Forestry Authority.

In 1995 2% of the North Somerset Rivers Catchment was forested. However Farming and Rural Conservation Agency (FRCA) statistics show that in 1995 2.3% (620 ha) of farmland in the catchment was farm woodland, an increase of 17.4% since 1985. This is in part due to improved planting grants and compensation for loss of agricultural production which have been available during the decade.

The woodland in the catchment is almost entirely found on the Carboniferous Limestone ridges (see Map 3 and Map 26). In the south of the catchment, the northern slopes of the Mendip are well wooded. This woodland contributes to the attractive landscape of the Mendips Area of Outstanding Natural Beauty (AONB).

The largest areas of woodland are found to the north east of Congresbury. There is little woodland in the floodplains of rivers. There is some scope for the limited planting of trees on river banks to provide shading, but only where maintenance is not affected and by agreement with the riparian owners.

Waterside trees and woodland can be beneficial to landscape and wildlife and can in some circumstances act as buffer strips alongside rivers to reduce the impact of agriculture. In the North Somerset Levels and Moors pollarded willows along the river margins are a characteristic feature.

Woodland management is not an issue for the Agency in this catchment.

23. Controlled Industrial Processes

The Environment Agency is the statutory authority in England and Wales for regulating the largest and most complex industrial processes. To do this we use a system known as Integrated Pollution Control (IPC). This system requires the use of best available techniques not entailing excessive cost (BATNEEC) to prevent the release of particular substances into the environment or, where this is not practicable, to minimize their release and render them harmless. Operators of these controlled processes are required to have an authorization granted by the Agency to operate the process and have to comply with the conditions to which it is subject.

Two lists of processes have been prescribed by regulations made under the Environmental Protection Act 1990, for control: Part A controlled under IPC by the Agency; releases to the air from Part B processes are controlled under a system of Local Authority Air Pollution Control. In this section we list Part A Process Operators (See Table 15) by process type and summarize the most significant releases to air permitted by their authorizations. Direct discharges to water are summarized in Section 20.

As well as the general BATNEEC condition another objective for all IPC authorized processes is to have regard to the best practicable environmental option (BPEO) to minimize pollution of the environment taken as a whole.

Table 15 Part A Process Operators

Operator	Description of processes	Main authorized releases into air
Fairey Hydraulics, Claverham	Cadmium Electroplating	Volatile Organic Compounds
GKN Westland Industrial Products Ltd, Weston-super-Mare	Cadmium Electroplating	Volatile Organic Compounds, Particulate Matter

24. Radioactive Substances

The Environment Agency is the enforcement authority for England and Wales of the Radioactive Substances Act 1993. This statute is concerned with the keeping, use and disposal of radioactive substances and, in particular, the regulation of radioactive waste disposal. Radioactive substances are present in the environment as a result both of natural processes and of man's technological developments. The uncontrolled and incautious use of these substances can pose both immediate and long term hazards.

The Environment Agency is the Competent Authority for a number of EC Directives on the shipment of radioactive substances and sealed sources between EU Member States. We also regulate shipments of radioactive waste into, out of, or through England and Wales.

The major nuclear establishments are licensed to operate by the Nuclear Installations Inspectorate (NII), but discharges from them are authorized by the Agency. These discharges arise from the day-to-day operations at the sites. Site operators are required to ensure that discharge conditions are met and also ensure that radiation dose limits to the public are not exceeded as a result of the discharges.

The sites in the catchment area which are currently registered under the Radioactive Substances Act are listed in Table 16. These sites are mainly manufacturing processes using sealed radioactive sources for industrial process control purposes, but also includes three larger users Bristol University at Langford and Long Ashton and Weston Area Health NHS Trust at Weston-super-Mare.

Table 16 Current Registered Users of Radioactive Substances

SITE	USE
Avon County Council, Social Security Department Nailsea	Gaseous Tritium Light Devices
Backwell Motors, Backwell	Elimination of static electricity
Bristol Industrial & Res Associates Portishead	Elimination of static electricity
Clist & Rattle Ltd, Cambridge Batch Garage Flax Bourton	Elimination of static electricity
GKN Westland Industrial Products Ltd Weston-super-Mare	In-flight monitoring instruments in aircraft
Ian Brown (Weston) Ltd Weston-super-Mare	Elimination of static electricity
Philip Harris Ltd Manufacturing & Biological Division Weston-super-Mare	Distribution of closed radioactive sources
Mr P Hasle T/A Coronation Garage Worle	Elimination of static electricity
Portishead Working Men's Club Portishead	Betalight self-powered sign
Seaking Automotive Ltd Portbury	Industrial Process Control
Tarmac Quarry Products (Southern) Ltd Stancombe Quarry, Flax Bourton	Density measurement
Technical Inspection Services (UK) Ltd Clevedon	Keeping and use of mobile radioactive sources
Tunstall Security Ltd Clevedon	Smoke detectors
University of Bristol, IACR Long Ashton Research Station, Long Ashton	Accumulation of organic liquid waste and very low level waste generated by research. Disposal of gaseous waste, aqueous waste, organic liquid waste and very low level waste generated by research
University of Bristol Veterinary Field Station Langford	As above
Wessex Water Services Ltd	Betalight self-powered sign
Weston Area Health NHS Trust Weston General Hospital Weston-super-Mare	Accumulation of solid waste and very low level waste generated by medical treatment. Disposal of aqueous waste, solid waste and very low level waste generated by medical treatment



Part 3

25. Area Environment Group

Name	Representing
Mr L R Fortune	Chairman, Appointed by Environment Agency
Ms B Carroll	Regional Environment Protection Advisory Committee
Mr M J Stoodley	Wessex Regional Fisheries Advisory Committee
Mr J R Bush	Wessex Regional Flood Defence Committee
Mr R W Wyatt	Water Resources
Mr S Hemmings	Waste Management
Mr M Hellings	Waste Management
Mr D Fish	Industry
Mr H S Lucas	Industry
Councillor N Jones OBE	Tourism
Mr R G Adlam	Agriculture
Ms J C Brookhouse	Conservation
Mrs A M Lennox	Recreation
Mr J L R Williams	Fisheries
Mr J B H Watkis	Flood Defence
Mrs L Bennett	Local Authority
Mrs N E Kirsan	Local Authority
Mr H P N Temperley	Local Authority
Mr C S W C Newbury	Local Authority
Dr R England	Education

26. Steering Group

Name	Representing
Miss A Brimble	North Somerset Council (Community Leisure)
Mr S Brooks	Monaghan Middlebrook Mushrooms Ltd
Mr J Comer	Country Landowners Association
Mrs C Dring	North Somerset Council (Planning)
Mr B Greenwood	English Nature
Mr J Harris	Somerset Local Flood Defence Committee
Mr J Hayward	British Canoe Union
Mr R Henley	The Bristol Port Company
Mr P Hodge	Bristol Water Company
Mr T McGrath	Avon Wildlife Trust
Mr R Osmond	Vice-Chairman West Mendip Internal Drainage Board
Mr J Purchase	Clevedon Angling Club
Mr M Venning	Wessex Water Plc

26.1 Public Registers and Access to Environmental Information

We maintain several public registers which can be inspected at most Environment Agency offices. Information is usually provided free of charge, but for large and complex requests we may charge for staff time and materials. There are also standard charges for some specific searches. Confidential information, incomplete or draft reports, and information where disclosure may lead to environmental damage are generally not available.

Further details about our public registers and the types of information we hold are available in our leaflet *A Guide to Information Available to the Public*. Copies are available at our Bridgwater office, or you can telephone and we will send one to you in the post. At present, offices may have information relevant only to their local area; please telephone our Customer Services Centre before you visit to ensure that the information you want is available at your local office. Our staff will be happy to help you with any queries you may have and if you call before you visit we will ensure that they are on hand to help you with your query.

Some environmental details and information about our public registers are available on the Internet on <http://www.environment-agency.gov.uk>

27. Glossary

AEG	Area Environment Group
AMP	Asset Management Plan
AONB	Area of Outstanding Natural Beauty, designated by the Countryside Commission to conserve and enhance the natural beauty of the landscape, mainly through planning controls
Aquifer	A layer of water-bearing rock
AWT	Avon Wildlife Trust
BATNEEC	Best Available Techniques Not Entailing Excessive Cost
BAP	Biodiversity Action Plan
BCU	British Canoe Union
BPEO	Best Practicable Environmental Option
BRERC	Bristol Regional Environmental Records Centre
BW	Bristol Water
CMP	Catchment Management Plan
CWS	County Wildlife Site
DETR	Department of the Environment, Transport and the Regions
EC	European Community
EN	English Nature
EPAQS	Expert Panel of Air Quality Standards
EQS	Environmental Quality Standard
ESA	Environmentally Sensitive Area
EU	European Union
FDMS	Flood Defence Management System
FRCA	Farming and Rural Conservation Agency
FWAG	Farming and Wildlife Advisory Group
HE	House Equivalents per kilometre
HMIP	Her Majesty's Inspectorate of Pollution, the former regulatory authority for IPC, and now part of the Environment Agency
HNDA	High Natural Dispersion Areas
IDB	Internal Drainage Board
IPC	Integrated Pollution Control, a system introduced to control pollution from industrial processes which could cause significant pollution to air, land and water
LEAP	Local Environment Agency Plan
LPA	Local Planning Authority
LNR	Local Nature Reserve
MAFF	Ministry of Agriculture, Fisheries and Food
NNR	National Nature Reserve, a site owned or leased and managed by English Nature and established as a reserve
NO	Nitrogen oxide

NO ₂	Nitrogen dioxide
NO _x	Oxides of nitrogen
NRA	National Rivers Authority
NSA	Nitrate Sensitive Area
NSL&MP	North Somerset Levels & Moors Project
NVZ	Nitrate Vulnerable Zone
OFWAT	Office of Water Services, the government regulatory agency for the water industry
PPPG	Policy and Practice for the Protection of Groundwater
pSAC	Proposed Special Area for Conservation designated under the EC Habitats Directive
R&D	Research and Development
RAMSAR	Sites identified by UK Government under the Convention on Wetlands of International Importance which was ratified by the UK Government in 1976
RE	River Ecosystem
RSPB	Royal Society for the Protection of Birds
RQO	River Quality Objective
SAC	Special Area for Conservation designated under the EC Habitats Directive
SAM	Scheduled Ancient Monument of national importance designated under the Ancient Monuments and Archaeological Areas Act 1979
SERC	Somerset Environmental Records Centre
SMP	Shoreline Management Plan
SNCI	Sites of Nature Conservation Interest
SoS	Standards of Service
SPA	Source Protection Area (Groundwater)
SPA	Special Protection Areas identified by UK Government under the EC Directive on the Conservation of Wild Birds
SSSI	Site of Special Scientific Interest of national importance designated under the Wildlife and Countryside Act 1981. Habitats, sites for individual species, geology and land forms may be designated
STW	Sewage Treatment Works
SWT	Somerset Wildlife Trust
Triassic	Geologic time period
UNECE	United Nations Economic Commission for Europe
UWWTD	EC Urban Waste Water Treatment Directive
VOC	Volatile Organic Compound
WHO	World Health Organisation
WRA	Waste Regulation Authority, now part of the Environment Agency
WWSL	Wessex Water Services Ltd

28. Units

mm	millimetre	m ³ /s	cubic metres per second (cumecs)	ppb	parts per billion
cm	centimetre	m ³ /d	cubic metres per day	mg/l	milligrams per litre
m	metre	l/s	litres per second	µg/l	micrograms per litre
km	kilometre	MI/d	megalitres per day		
km ²	square kilometre	MI/y	megalitres per year	µg/m ³	microgram per cubic metre
ha	hectare	te	metric tonne		
ml	millilitre	ppm	parts per million		

29. References

- Action for Biodiversity in the South West - a series of habitat and species plans to guide delivery. June 1997 ISBN 0903138972
- An Environmental Strategy for the Millennium and Beyond. Environment Agency 1997. HO-9/97-100K-D-BABF
- Avon County Structure Plan
- Avon Landscape Strategy
- Control of Pollution (Amendment) Act 1989
- Control of Pollution Act 1974
- DETR Circular 30/92 Development and Flood Risk

- EC Directive Air Quality Standards for Nitrogen Dioxide (85/203/EEC)
- EC Directive Concerning the Quality of Bathing Water (76/160/EEC)
- EC Directive Concerning Urban Waste Water Treatment (91/271/EEC)
- EC Directive on Freshwater Fish (78/659/EEC)
- EC Directive on Pollution Caused by the Discharge of Certain Dangerous Substances into the Aquatic Environment (76/464/EEC)
- EC Directive on Species and Habitats (92/43/EEC)
- EC Directive on the Conservation of Wild Birds (79/409/EEC)
- EC Directive on the Protection of Groundwater against Pollution Caused by Certain Dangerous Substances (80/68/EEC)
- EC Directive on the Protection of the Environment, and in Particular of the Soil, when Sewage Sludge is Used in Agriculture (86/278/EEC)
- EC Nitrates Directive (91/676/EEC)
- EC Surface Water Abstraction Directive (75/440/EEC)
- English Nature Natural Area Profile
- English Nature Rhine and Ditch Survey (1992)
- Environment Act 1995
- Environment Agency (1996) River Habitat Survey: Field Guidance Manual
- Environmental Protection Act 1990
- European Communities Act 1972
- Forest of Avon Plan
- Furse, M.T. (1995) The Faunal Richness of Headwater Streams: Stage 4 - Development of a Conservation Strategy. NRA R&D Note 455, NRA, Bristol
- Health and Safety at Work Act
- Hedgerow Protection Act, 1997
- HMSO (1986) Control of Pesticide Regulations. SI 1510
- HMSO (1989) Sludge (Use in Agriculture) Regulations. SI 1263
- HMSO (1990) Code of Practice for the Safe Use of Pesticides on Farms and Holdings. MAFF
- HMSO (1992) Code of Good Agricultural Practice for the Protection of Air. MAFF/WOAD
- HMSO (1993) Code of Good Agricultural Practice for the Protection of Water. MAFF/WOAD
- HMSO (1993) Code of Good Agricultural Practice for the Protection of Soil. MAFF/WOAD
- HMSO (1993) The Forests & Water Guidelines
- HMSO (1994) Waste Management Licensing Regulations. SI 1056
- HMSO (1995) Biodiversity: the UK Steering Group Report. London, 2 Vols.
- HMSO (1995) Making Waste Work. Department of the Environment and The Welsh Office
- HMSO (1996) A Review of the Potential Effects of Climate Change in the United Kingdom. UK Climate Change Impact Review Group
- HMSO (1996) The Special Waste Regulations. SI 972
- Land Drainage Act 1991
- Landscape Assessment of the Mendip Hills
- Making Waste Work (December 1995)
- Mendip Biodiversity Action Plan SERC 1995
- North Somerset Countryside Strategy
- NRA (1991) Proposals for Statutory Water Quality Objectives. Water Quality Series 5
- NRA (1991) The Quality of Rivers, Canals and Estuaries in England and Wales. Water Quality Series 14
- NRA (1992) Policy and Practice for the Protection of Groundwater
- NRA (1994) The Quality of Rivers and Canals in England and Wales (1990 to 1992) Water Quality Series 19. HO-6/94-5k-C-AJTC
- NRA (1995) Saving Water - The NRA's Approach to Water Conservation and Demand Management. HO-9/95-1.5k-B-AQHH
- NRA (1995) Tomorrow's Water, NRA South Western Region Water Resources Strategy. SW-4/95-1k-B-ANOQ
- Producer Responsibility Obligations (Packaging Waste) Regulations (March 1997)
- Radioactive Substances Act 1993
- Reducing Emissions of Sulphur Dioxide, A Strategy for the United Kingdom
- Salmon and Freshwater Fisheries Act 1975
- Somerset County Minerals Plan
- Somerset Levels and Moors Landscape Assessment for Monitoring, July 1990, MAFF
- The Biodiversity of the South West - an audit of the South West biological resource May 1996. ISBN 0903138920
- The Environment of England and Wales - A Snapshot (April 1996)
- The Quality of Rivers and Canals in England and Wales 1995. Environment Agency HO-9/97/-5K-C-AZOR
- Local Environment Agency Plan North Somerset Rivers Consultation Report

The Water-vole (*Arvicola terrestris*) in Britain 1989-1990: Its Distribution and Changing Status, The Vincent Wildlife Trust
UK Biodiversity Plan
Waste Management Plan, Avon County Council, March 1996
Waste Management Strategy for Somerset, 1996
Water Resources Act 1991
Wildlife and Countryside Act 1981
Woodspring District Wide Local Plan

MANAGEMENT AND CONTACTS:

The Environment Agency delivers a service to its customers, with the emphasis on authority and accountability at the most local level possible. It aims to be cost-effective and efficient and to offer the best service and value for money.

Head Office is responsible for overall policy and relationships with national bodies including Government.

Rio House, Waterside Drive, Aztec West, Almondsbury, Bristol BS32 4UD
Tel: 01454 624 400 Fax: 01454 624 409

ENVIRONMENT AGENCY REGIONAL OFFICES

ANGLIAN

Kingfisher House
Goldhay Way
Orton Goldhay
Peterborough PE2 5ZR
Tel: 01733 371 811
Fax: 01733 231 840

SOUTHERN

Guildbourne House
Chatsworth Road
Worthing
West Sussex BN11 1LD
Tel: 01903 832 000
Fax: 01903 821 832

NORTH EAST

Rivers House
21 Park Square South
Leeds LS1 2QG
Tel: 0113 244 0191
Fax: 0113 246 1889

SOUTH WEST

Manley House
Kestrel Way
Exeter EX2 7LQ
Tel: 01392 444 000
Fax: 01392 444 238

NORTH WEST

Richard Fairclough House
Knutsford Road
Warrington WA4 1HG
Tel: 01925 653 999
Fax: 01925 415 961

THAMES

Kings Meadow House
Kings Meadow Road
Reading RG1 8DQ
Tel: 0118 953 5000
Fax: 0118 950 0388

MIDLANDS

Sapphire East
550 Streetsbrook Road
Solihull B91 1QT
Tel: 0121 711 2324
Fax: 0121 711 5824

WELSH

Rivers House/Plas-yr-Afon
St Mellons Business Park
St Mellons
Cardiff CF3 0LT
Tel: 01222 770 088
Fax: 01222 798 555



For general enquiries please call your local Environment Agency office. If you are unsure who to contact, or which is your local office, please call our general enquiry line.

ENVIRONMENT AGENCY GENERAL ENQUIRY LINE

0645 333 111


The 24-hour emergency hotline number for reporting all environmental incidents relating to air, land and water.

ENVIRONMENT AGENCY EMERGENCY HOTLINE

0800 80 70 60



**ENVIRONMENT
AGENCY**



North Wessex Area
Rivers House
East Quay
Bridgwater
Somerset
TA6 4YS