

local environment agency plan

BRUE AND AXE CONSULTATION REPORT JULY 1997



ENVIRONMENT
AGENCY



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FOREWORD

This Local Environment Agency Plan represents a significant step forward in environmental thinking. 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 Government's answer was to create the Environment Agency with the umbrella responsibility for all three. The role and duties of the Agency are set out in this Consultation Report.

This holistic approach is now reflected in this Plan. It is a logical development of the Catchment Management Plans prepared by the former National Rivers Authority, now subsumed into the new Agency. It sets out the environmental problems of the area in a way which has not been done before, and suggests the most important issues which should now be addressed. It is, I believe, vital reading for everyone concerned with the future of North Wessex.

The catchment of the Rivers Brue and Axe encompasses a varied and complex environment, which includes a major part of the important Somerset Levels and Moors. The Plan covers all the work of the Environment Agency - water management, waste regulation and the control of heavy industrial processes.

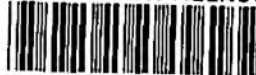
We look forward to hearing your views on the many environmental issues discussed here and I hope that with the help of our partners we can work towards a better environment in this area.



CHRIS BIRKS
AREA MANAGER (NORTH WESSEX)

Environment Agency
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ENVIRONMENT AGENCY



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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 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 to:

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

by **31 October 1997**.

HOW TO USE THIS CONSULTATION REPORT

For advice on how to use this Consultation Report please see Section 1.2.5.

THE NEXT STAGE

We will collate responses to this Consultation Report and publish an Action Plan in spring 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 INQUIRIES

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.

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Published July 1997

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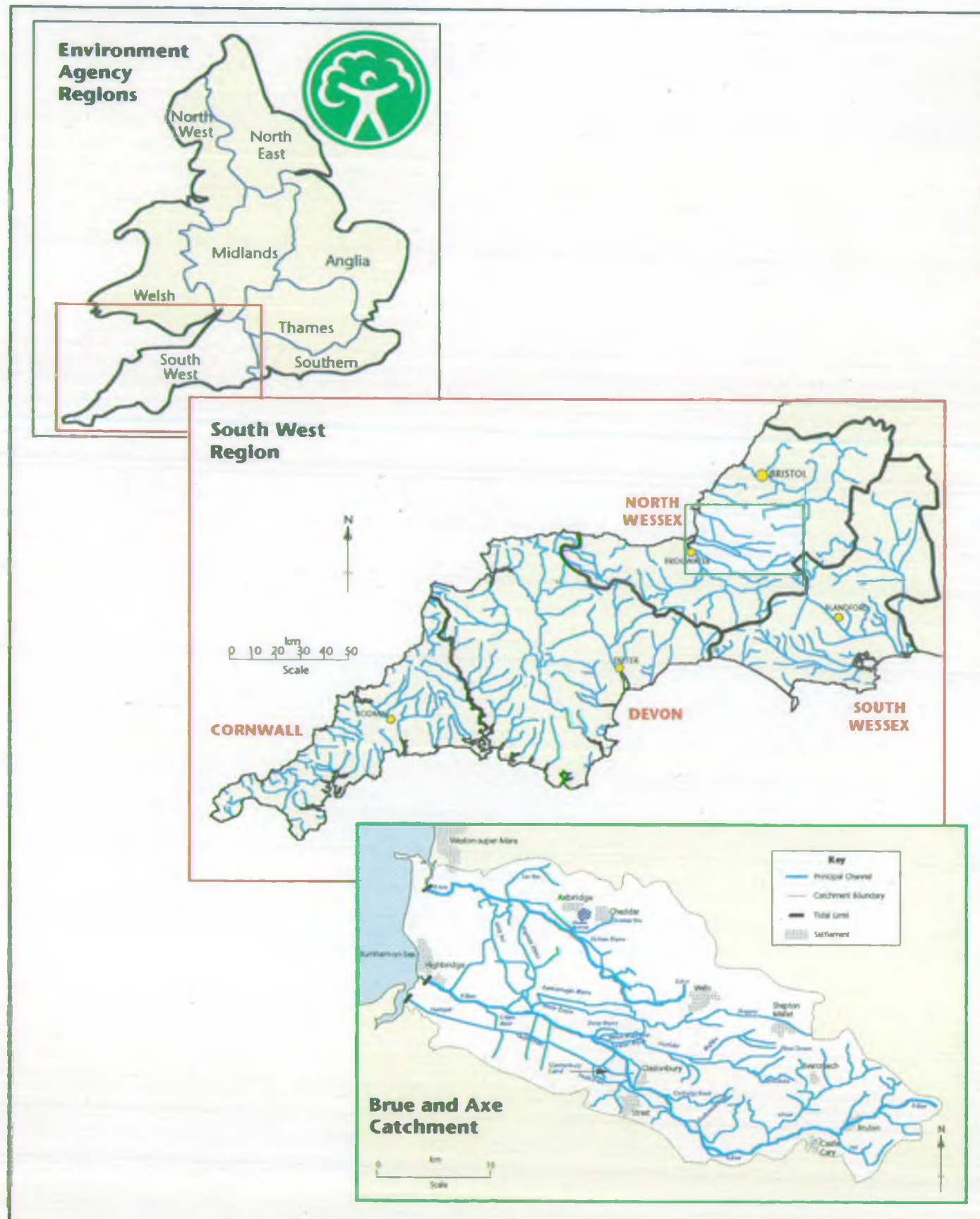
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Map 1 Brue and Axe Catchment Location



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Brue and Axe Local Environment Agency Plan
Environment Agency

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, industry and agriculture are managed to maintain and where possible enhance the exceptional conservation value of this area, without causing undue harm to the local economy
- 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 minimisation targets to be achieved locally to significantly reduce stress on the environment from waste disposal
- we want acceptable levels of flood protection with minimum cost to the community

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. Introduction

1.1 The Environment Agency

1.1.1 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 with policy links to the Welsh Office and the Ministry of Agriculture, Fisheries and Food.

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 Department of the Environment (DoE).

We provide a comprehensive approach to the protection of the environment by combining the regulation of air, land and water into a single organisation. 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 maximise 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, re-use 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.

1.1.2 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. (See Issue 3.14).

1.1.3 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.

1.1.4 What we do not do

We do not cover all aspects of environmental legislation and service to the general public. Your local authority deals with all noise problems; litter; air pollution arising from vehicles, household areas, small businesses and small industries; planning permission (they will contact us when necessary); contaminated land issues (in liaison with ourselves); and environmental health issues.

1.2 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.

An 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.

1.2.1 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 twenty members (see Section 23) 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 Brue and Axe Steering Group has sixteen external members (see Section 24 for a list of members).

1.2.2 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.

1.2.3 The Action Plan

We will collate responses to this Report and publish an Action Plan in spring 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.

1.2.4 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.

1.2.5 How to use this plan

This Report 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 and Actions" for the resolution of these issues are also proposed but these are not exhaustive
- "Protection through Partnership" which outlines the work that we do in collaboration with other organisations and where the work of other organisations plays an important part in helping us to achieve some of our aims and objectives.

Part 2 contains:

- a detailed account of catchment uses, activities and pressures. 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.

1.2.6 Indicative LEAP publication programme

North Somerset Rivers	early spring 1998
West Somerset Rivers	late spring 1998
Bristol Avon	late summer 1998
Parrett and Tone	autumn 1999

1.3 The LEAP Area

This plan area comprises the surface water catchments of the rivers Brue and Axe and lies wholly within the county of Somerset. (See Map 2). The majority of the population of 102,600 (1991 Census) is concentrated in eleven comparatively small settlements. The neighbouring towns of Burnham-on-Sea and Highbridge form the largest settlement with a population of approximately 17,000.

The River Brue rises in the clay uplands to the east of the catchment, before flowing slowly through the flat lowlands of the Somerset Levels and Moors, often in man-made channels, before entering the sea at Highbridge.

The River Sheppey and the River Axe and its tributaries the Cheddar Yeo and Lox Yeo, rise from limestone springs on the Mendips, before flowing through the Somerset Levels and Moors to the sea just north of Brean Down. The rivers are interconnected in several places by rhynes controlled by sluices, forming a very complex artificial drainage system.

Much of the catchment is lowland wet grassland and forms part of the unique landscape of the Somerset Levels and Moors.

The catchment is of major importance to wildlife conservation with 51 Sites of Special Scientific Interest (SSSIs) and 33 County Wildlife Sites. Large areas, including Bridgwater Bay are designated as

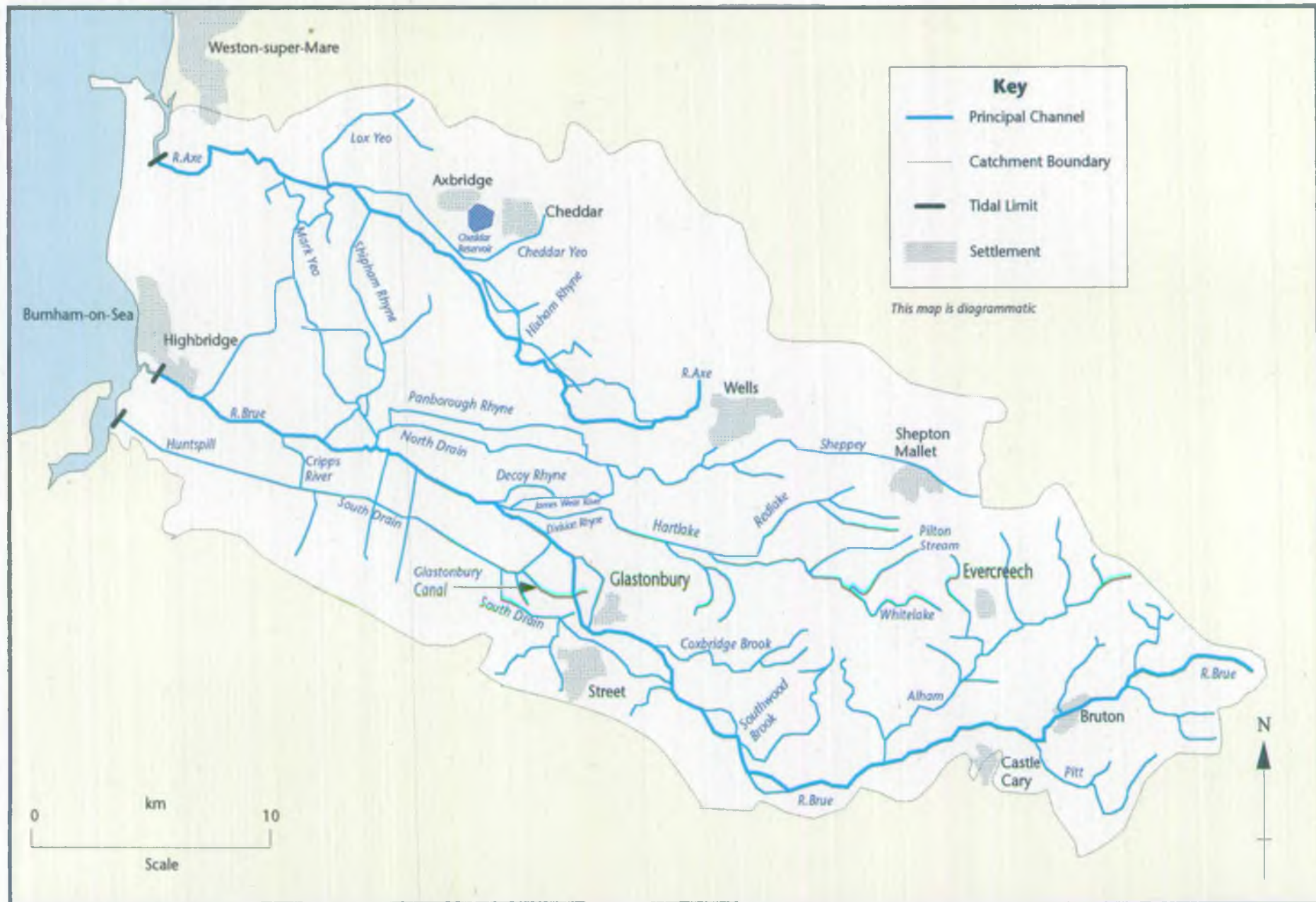
Special Areas of Conservation (SAC) and RAMSAR sites, for the conservation of wild birds and wetland flora and fauna.

The catchment also contains a large number of Scheduled Ancient Monuments, particularly in the South Mendips.

The catchment is predominantly agricultural with an increasing amount of tourism including the evolving Avalon Marshes Project to the west of Glastonbury. There is a Royal Ordnance Factory at Puriton just to the north of Bridgwater. Some light industry is centred around the main towns and there are two limestone quarries in the Mendips. There is cider making at Shepton Mallet, a paper mill at Wells and peat extraction to the west of Glastonbury.

In 1995, 27% of river length in the Brue and Axe Catchment was of good or very good chemical quality, while 60% was fair and 13% was of poor or bad quality. In biological terms 60% of the catchment was of excellent quality and the remaining 40% was good or fairly good quality. Between 1990 and 1995 there was an overall improvement in chemical quality of 15% of river length while biological quality improved in 35% of the catchment. The large difference in biological quality between 1990 and 1995 is considered partly attributable to inconsistency in methodology between these years.

Map 2 Brue and Axe Catchment



2. Protection Through Partnership

The Agency works in partnership with many organisations 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 recreational 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.

2.1 Links with Local Authorities

We advise the local planning authorities on the impact of proposed development together with our requirements for environmental protection (See Section 16). 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.

2.2 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 need to develop partnerships to develop and implement Local Air Quality Management Plans.

2.3 Amenity and Recreation Initiatives

We work on local authority led recreation initiatives. Local authorities often own the riverside land in towns and we work with them on schemes to enhance the town centre river corridor with, for example, landscaping, walkways and riverside seating.

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

2.4 Litter

The Agency has no powers or resources to clear litter in and around rivers and so there is a need to work with local authorities and other groups on reduction and clearance schemes.

2.5 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.

2.6 Shoreline Management Plans (SMPs)

SMPs are being produced by a range of groups with statutory interests working together. They provide a forum for an integrated review of coastal processes and develop sustainable coastal defence policies to set objectives for the future management of the shoreline. The SMP that includes the coast within this LEAP is called the Bridgwater and Bideford Bays SMP.

2.7 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 which aims to reduce waste, packaging, effluent and energy use and thereby both help the environment and save the business 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.

2.8 Links with Government Bodies

2.8.1 Conservation

The Agency, MAFF and English Nature are working in partnership with local farmers and Internal Drainage Boards to produce Raised Water Level Areas to provide the ideal habitat for over-wintering wildfowl and to preserve the peat soils. We engage in jointly funded survey and monitoring work with English Nature such as waterfowl counts and ditch plant surveys on the Somerset Levels and Moors.

2.8.2 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.

2.9 Examples of Partnerships

An extensive programme of wetland restoration is being undertaken within the Peat Production Zone now known as the Avalon Marshes Project. The principal agents are Somerset County Council, English Nature, the RSPB and Somerset Wildlife Trust.

Species survey work with Somerset Wildlife Trust, Somerset Environmental Records Centre, and the Hawk and Owl Trust.

The Somerset Levels and Moors Partnership (LAMP) was formed in 1995 as the successor to the Levels and Moors Countryside forum, and is made up of local authority members, people from community organisations and statutory bodies including the Environment Agency.

It consists of three parts:

LAMP - made up of about 27 members including six elected Parish Council Forum representatives

Levels and Moors Parish Council Forum - with over 90 member parishes providing direct community oversight

LAMP Steering Group - drawn from LAMP and consisting principally of elected community representatives.

Its key tasks are:

- the formulation of strategies for the Levels and Moors
- Consultations and Reviews
- advise on the co-ordination of the actions of the five main local authorities
- promotion of public awareness and community "pride of place".

Within this Catchment LAMPs activities have so far focused mainly on the afteruse of the Peat Production Zones of the Brue Valley and associated initiatives and activities such as tourism and recreation.

3. 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 October 1997 and will be published in our Brue and Axe LEAP Action Plan.

3.1 Issue - The impact of abstraction, penning and field irrigation

3.1.1 Background

Only a small proportion of the Catchment lies above the typical lowland water table. In summer the flow of groundwater from the upland is only just sufficient to satisfy the demands of the river, abstraction, and irrigation of the Moors and Levels. At times in the summer, the water resources of the Catchment are fully committed with no discharge to tidal waters. The irrigation of the Moors and Levels is achieved by holding back water with sluices or weirs (penning) and diverting flow sideways to top up the rhynes.

This traditional use of water must now compete with contemporary demands for water resources. Flow in some of the tributaries of the Axe is reduced by abstraction for public water supply. There is a very large public water supply abstraction from the source of the Cheddar Yeo. The Agency regulates this use of water through the abstraction licensing system (see Section 17) although its powers to reduce existing licensed abstraction are very limited. The Cheddar abstraction has a licence of right which pre-dates the existing licence determination system.

Developments to regenerate wetlands in the Brue and Axe valleys (see Section 8.6) will require the redistribution of water within the lowland system. Unless carefully planned these changes may

exacerbate problems associated with low flows. See the Agency's "Somerset Levels and Moors Water Level Management and Nature Conservation Strategy".

3.1.2 Effects

The River Brue and the River Axe regularly cease to discharge to the sea in the summer months. Under these conditions both rivers are stagnant and weed growth can become excessive.

Penning and low river flow causes or contributes to:

- significant failure of River Quality Objective (RQO) on the North Drain (see Section 5) because of low dissolved oxygen and elevated organic load (BOD)
- marginal failure of RQOs on the River Brue and South Drain
- marginal failure of Long Term RQO on River Brue, Hartlake, River Axe and Lox Yeo
- duckweed
- adverse effects on the fisheries
- the siltation of Brue Pill.

Algal blooms can be a particular problem on penned rivers during low flows. Algal blooms caused or contributed to:

- exceedence of EC Freshwater Fish Directive (see Section 5) standards at Tealham Moor on the North Drain
- marginal failure of RQO on South Drain
- marginal failure of Long Term RQO on River Axe.

Option for action	Responsibility
Review control of penning structures.	Agency
Avoid water losses by efficient use of the irrigation network.	Agency, IDBs
Address acute water quality problems by short term measures such as aeration to increase dissolved oxygen levels.	Agency
Draw up memoranda of understanding with other users such as IDBs and conservation bodies to secure wise use of resources.	Agency, IDBs, SWT, EN, RSPB
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.	Agency, IDBs
Consider the provision of additional storage volume to provide more irrigation water.	Agency

3.2 Issue - The impact of river canalization and maintenance

3.2.1 Background

The Brue and Axe are highly modified rivers and have been maintained by successive generations to control flooding and provide water for summer irrigation.

The present river channels have been substantially re-engineered and new channels such as the Huntspill River have been created. Present standards of flood protection can only be sustained by intensive maintenance of the channels and banks. This maintenance regime can bring environmental problems affecting water quality and river habitats. (See Map 15, Map 16 and Map 17).

The current review of flood defence maintenance should reveal if present practice is both justified and sustainable in both financial and environmental terms. Conservation bodies are concerned that maintenance practices are biased to favour agriculture, and do not respect the special environmental value of the Somerset Levels and Moors. An overall review and statement of the justification of these practices is needed.

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 prioritising 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.

3.2.2 Effects

- dredging and weed cutting often degrades river habitats and limits 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. Soon after the removal of weed dissolved oxygen levels often improve to a level above pre-cutting conditions
- channels in the past have been straightened for improved drainage to the detriment of habitat diversity.

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 methodology by August 1997. (See 15.3).	Agency
Complete Somerset Levels and Moors Review analysis by August 1997.	Agency
Target standards of flood protection will be compared to the current state, and differences addressed in 1998.	Agency
Conduct an overall review and prepare statement of justification for flood defence operations on the Somerset Levels and Moors.	Agency
Seek resources to re-engineer channels and floodbanks to provide a more natural shape as need or opportunity arises.	Agency
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.	Agency

3.3 Issue - Eutrophication

3.3.1 Background

Eutrophication can occur when water contains excess plant nutrients. Runoff from farmland and discharges from sewage treatment works both contain plant nutrients such as nitrogen and phosphorus. This nutrient enrichment often leads to luxuriant water plant growth, especially when the body of water is stagnant such as a lake, pond or penned river stretch. Algal blooms and water plants such as duckweed (*Lemna*) can choke eutrophic waters, reducing the quality of the water and the range of plants and animals it can support.

Two EC Directives can provide remedies, but only if special conditions are met.

The EC Urban Waste Water Treatment Directive (see 25.2.3) requires special standards of treatment for discharges to certain sensitive areas. Discharges to the Brue and Axe Catchment do not qualify for special treatment under this directive. The EC Nitrates Directive (see 25.2.4) requires member states to identify waters that are or could be affected by pollution from nitrates from agricultural sources. The rivers in the Brue and Axe Catchment have not been identified as being affected by pollution from nitrates under the terms of this directive.

3.3.2 Effects

- The Agency, English Nature and the Wildlife Trusts are concerned about the proliferation of those plants indicative of high nutrient levels within wetland SSSIs in this catchment and the consequent reduction in biodiversity
- It is thought by some that excess nutrients especially nitrogen and phosphorus may also have an adverse effect on the wetland archaeology within the catchment by accelerating decay
- Algal blooms sometimes occur and lead to reduced water quality.

Options for action	Responsibility
Establish the frequency of algal blooms, the extent of eutrophic effects and the source of excess nutrients.	Agency
Work with others to reduce nutrient levels by controlling point sources, and diffuse agricultural pollution (See Issue 3.9).	Agency, farmers, MAFF
Promote the creation of buffer strips to take up excess fertilizer runoff.	Agency, MAFF
Repeat 1994 baseline evaluation of water quality and biological conditions in SSSIs in 1999.	Agency
Control spreading of waste to land to prevent runoff to rivers.	Agency, farmers, MAFF
Review consents likely to affect Somerset Levels and Moors SPA, especially with a view to including nutrients.	Agency

3.4 Issue - Use of Environment Agency owned land

3.4.1 Discussion

We own significant areas of riverside land within the catchment, principally along the Huntspill and South Drain. 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 Huntspill in particular has great potential. It is a National Nature Reserve and we are enhancing the habitat by creating bankside reedbeds and altering the grassland management regime. We have also been approached by the British Canoe Union regarding use of the river for canoeing and rowing. We have agreed to permissive cycleways along the bank.

Areas in need of improvement should be identified in conjunction with the Local Authority. Around Glastonbury in particular, access to the River Brue could be greatly improved for use by the general public.

Options for action	Responsibility
Complete our Huntspill conservation and recreation management plan.	Agency
Help to develop riparian footpaths particularly in and around towns in partnership with others.	Local Authorities, riparian owners, Agency
Develop canoe access to watercourses where the Agency owns the land.	Agency, BCU

3.5 Issue - Maintaining and enhancing biodiversity

3.5.1 Background

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 Action Plan lists key habitats and species which need protection, through Regional and Local Biodiversity Action Plans. The Regional Biodiversity Audit Plan for the South West was published in April 1996. The Regional and Local Action Plans are currently being developed by local authorities and others.

We are working with a number of organisations 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)
- The Mendip District Council BAP
- Local Agenda 21 Action Plan
- Mid Somerset Hills Natural Area BAP

The Agency is developing National Species Action Plans and is the contact point for the following species which are known to occur within the catchment: otter, water vole, native crayfish, and freshwater pea mussel.

The Agency also has an important role to play in the conservation of habitats including: lowland wet grassland; rhynes and ditches; reedbeds; fen meadows; raised mires; tufa depositing springs and headwater streams. For more information on species and habitats in the catchment see Section 8. We aim to protect sensitive sites through our authorizations to abstract water and discharge effluents.

Options for action		
Habitats and/or species	Option	Responsibility
Rhynes and ditches (and associated species of plants and invertebrates).	Repeat 1994 baseline evaluation of water quality and biological conditions in SSSIs in 1999 (see Section 8).	Agency, EN
Reedbeds.	Provide advice to assist in habitat creation schemes, as at Shapwick Heath and Ham Wall.	Agency
Fen meadows and raised mire communities.	Continue national programme to reduce emissions of sulphur and nitrogen oxides from major power plant.	Agency, National Power
Lowland wet grassland	Participate in the production of Water Level Management Plans	IDBs, landowners
Tufa depositing springs and headwater streams.	Survey to assess value and develop conservation strategy.	Agency, SERC, SWT
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, SWT
Otters	Assist with the monitoring of otter populations.	Agency, SWT
	Establish water quality objectives necessary to maintain otter populations.	Agency
	Analyse tissue of road casualties.	Agency
Eels	Implement recommendations of Barriers to Migration survey.	Agency
Barn owls	Provide and monitor nest boxes and manage habitat to encourage voles on Agency owned land.	Agency, Hawk and Owl Trust
Native crayfish	Continue to support survey work, particularly within the Alham catchment to enable the formulation of a conservation strategy.	Agency
Invasive plants	Continue to assess the problem.	Agency

3.6 Issue - The impact of the Royal Ordnance factory

3.6.1 Background

Under an agreement set up in 1953 the Environment Agency has inherited the sole responsibility for the operational control and maintenance of the open channel effluent drain from the Royal Ordnance works commonly called the "Acid Ditch", although this title is no longer deserved - see below.

Due to the acidity of the effluent arising from the manufacturing processes operated since the 1940s at the Puriton ordnance factory, it was discharged to the tidal River Parrett, near the mouth of the Huntspill River, through a clay-lined channel, open for most of its length, although the final section was culverted in the 1980s.

As sole operators of the effluent drain, it is the Agency's duty under the Health & Safety at Work Act and duty of care to consider the risks and safety of the operation in the light of modern management and safety standards.

In the early 1990s the pH of the effluent varied in the range 2 to 9 and also contained toxic organic compounds. Immersion or ingestion of effluent in the lower part of the range would have been unpleasant and possibly dangerous.

The main processes operated by Royal Ordnance became the subject of an Integrated Pollution Control (IPC) Authorization during 1993-5 and as a result of the pressures to make necessary environmental improvements, effluent treatment was implemented prior to the flow entering the Acid Ditch. This involves neutralization, typically to pH 6.5-7.5, followed by low energy input biological oxidation in a large reedbed system. The effluent flowing through the ditch now constitutes a small risk to people and wildlife.

3.6.2 Options for Action

We need to continue monitoring the effluent quality to ensure the problem of acidity will not allow an unexpected return to the safety hazard that existed in the early 1990s and before. Achievement of the full potential of the reedbed system under the IPC Improvement Programme to the level required by the Agency from October 1997 will further lower the toxic organic content which, although it will not remove all risks, will lead to the risk being reduced.

3.7 Issue - Securing future public water supplies

3.7.1 Background

The current level of demand in Bristol Water's Supply Area is forecast to rise from 310 MI/d to 427 MI/d by 2021 assuming the current level of metering and leakage control with high growth in domestic, industrial and commercial consumption. Should growth in consumption be slower and Bristol Water reduce leakage to 120 litres per property per day then demand is forecast to rise to 380 MI/d by 2021.

Currently, Bristol Water's resources exceed demand by 17 MI/d. In 2021, under the lower demand forecast scenario the company's demand is predicted to exceed resources by 19 MI/d. Under the higher demand scenario the deficit is forecast to rise to 66 MI/d by 2021.

The above is based on average demand not peak demand. Despite the very dry weather and elevated demands for public water during 1995 both Bristol Water and Wessex Water were able to meet their customer's needs with no or minimal restriction. However, it is clear that an analysis of peak demand against resources rather than average demand could bring forward some of the supply deficits mentioned in this section. For full details of the wider water resources situation see the Agency's South West Regional Water Resources Strategy document "Tomorrow's Water".

Options for action	Responsibility
Manage demand To manage demand for water we encourage the installation of water meters and water saving devices in all new domestic properties and selective metering of existing properties where there is significant stress on water resources. The Agency will be examining water companies at the local demand area scale to identify problem sites. The Agency also encourages the more efficient use of water as part of a wide programme of demand management.	Consumers, Bristol Water, Agency
Manage resources We are keen to see better management of existing resources. Leakage control, where economic, should be actively pursued by the water companies. Conjunctive use of sources can increase the amount of water deliverable without the need for physical development.	Bristol Water, Agency
Develop resources This is our least favoured option. Before new resources are developed we would expect the water company to have made progress on demand and resource management.	Bristol Water, Agency

3.8 Issue - The impact of peat extraction

3.8.1 Background

The Brue valley contains significant areas of peat workings (see Map 21). Land must be drained to allow peat excavation. This drainage alters the hydrology over wide areas and has damaged some sensitive wetland habitats. Drainage also threatens the important archaeological assets of the area, although ironically the excavation of peat has uncovered some of the most important wetland archaeological finds in the country. Dewatering from peat extraction sites does not require an abstraction licence. Water pumped from excavated areas can be of significantly different chemical and physical quality to the surrounding ditches and can harm ecologically sensitive sites. The restoration of peat diggings for wildlife and recreation has great potential to enhance the biodiversity of the area (see Section 8).

3.8.2 Effects

Pumping out of peat diggings caused or contributed to:

- exceedance of EC Freshwater Fish Directive standards at Tealham Moor on the North Drain. (See Table 2)
- damage to wetland habitats
- local subsidence due to peat shrinkage.

Options for action	Responsibility
Complete the review of River Brue water balance.	Agency
Work with others on the Avalon Marshes wetland restoration within the Peat Production Zone.	Agency
Investigate the relative contributions of the various causes of EC Freshwater Fish Directive failure	Agency

3.9 Issue - The impact of agriculture

3.9.1 Background

Agriculture is important to the economy and the environment of the area and the local farming economy is changing rapidly (see Section 20). The environmental burden from agriculture can be significant in some parts of the area. Problems are often most acute when traditional land management practices change for example from permanent pasture to the intensive outdoor rearing of pigs. This practice has raised concerns about possible pollution of important aquifers in the Mendips. MAFF are currently carrying out R&D on nitrogen losses to groundwaters from outdoor pigs which will form the basis for a Code of Good Practice for outdoor pig farming stipulating stocking densities required to prevent pollution. The Agency is in close liaison with this project and will be collaborating to extend the study to cover our concerns with soil erosion.

Current water management practices on the low lying moors are causing long term irreversible changes to the soil structure. This method of farming is not sustainable but may be exacerbated if farmers switch from cattle to arable and vegetable production. In addition soils in cultivated areas are at risk from erosion in hot, dry and windy conditions.

The ESA scheme (see Section 20.1) aims to safeguard agricultural landscapes and maintain traditional farming practices. Many of the initiatives to support biodiversity conservation in the area (see Section 8) depend on the sensitive management of agricultural land.

3.9.2 Effects

Agricultural effluents or runoff from agricultural land caused or contributed to:

- exceedence of EC Freshwater Fish Directive standards at Tealham Moor on the North Drain and at Cow Bridge on the River Brue
- significant failure of RQO on the North Drain, River Alham and River Axe
- marginal failure of RQO on the River Sheppey. In the past farm discharges have affected water quality in the Sheppey but these discharges have now stopped
- marginal failure of Long Term RQO on River Alham and River Axe
- intensive outdoor rearing of pigs brings risk of soil erosion and nitrate pollution of groundwater in the Mendips.

Options for action	Responsibility
Farm pollution prevention campaigns.	Agency
Investigate farm inputs to the North Drain.	Agency
Continue with farm visit campaign on the River Alham.	Agency
Increase monitoring for consent compliance.	Agency
Review consents where necessary.	Agency
R&D on nitrogen losses to groundwater from outdoor pigs.	MAFF, Agency

3.10 Issue - The impact of sewage treatment works

3.10.1 Background

There are 21 public sewage treatment works (STW) in the Brue and Axe Catchment. There are no substantial private sewage treatment works but there are five that have a consented BOD load of greater than 0.3 kg/day. We regulate effluent disposal by issuing consents to discharge (see Section 18) and carrying out a major programme of monitoring to assess compliance both with the consents and of the receiving watercourse with its RQO. (See Section 5).

We have had some concerns about two STWs in this catchment: Shepton Mallet STW and Wells STW.

Shepton Mallet STW receives the trade effluent from a cider factory. In the past the STW has failed its upper tier consent during the apple pressing season. Remedial work has been undertaken at the STW which now complies with its consent. However, the discharge from the STW may still have the potential to cause non-compliance with the RQO in the River Sheppey. This requires further investigation.

At present we are unable to quantify the impact of Wells STW on the Keward Brook as monitoring points were inappropriately located. This has now been addressed by setting up two new monitoring points on the Keward Brook to fully establish the effect of Wells STW on downstream water quality.

3.10.2 Effects

- The discharge from Shepton Mallet STW has caused marginal failure of the RQO on one stretch of the River Sheppey.

Options for action	Responsibility
Shepton Mallet -continue to monitor the performance of the STW and its impact on water quality in the River Sheppey.	WWSL, Agency
Shepton Mallet - review discharge arrangements from cider factory	Agency
Wells - collect water quality data at the new monitoring locations on the Keward Brook in order to assess the impact of Wells STW on downstream water quality.	Agency
General - Review current consent to discharge standards in relation to SPA/RAMSAR designation.	Agency

3.11 Issue - The impact of septic tanks and soakaways

3.11.1 Background

There are many areas within the Brue/Axe catchment which do not have mains drainage for sewage disposal but which rely on septic tanks and soakaways. Heavy clay soils prevent foul water from soaking away and so may cause pollution of watercourses, for example in Mark, Lympham, Badgworth and Blackford. New development in such areas is restricted to methods of foul effluent disposal which do not involve septic tanks and soakaways. (See Section 18).

3.11.2 Effects

- marginal failure of long term RQO on Hartlake
- there are many discharges - septic tanks, soakaways etc. that are affecting surface water quality in unmonitored headwaters and very small tributaries.

Options for Action	Responsibility
Investigate and report on impact in support of first time sewerage schemes. (See Section 18).	Agency
Improve awareness of need for good management practice for small sewerage systems.	Agency
Identify and remedy illegal discharges through negotiation (legislative powers where necessary).	Agency
Identify problem discharges to designated conservation areas and take appropriate action.	Agency

3.12 Issue - The impact of St Cuthberts Paper Mill

3.12.1 Background

Paper processing generates waste effluents with considerable polluting potential. Proper waste minimisation and treatment facilities are needed if mills are to achieve good effluent standards. The Agency regulates the discharge of effluents using discharge consents (see Section 18).

3.12.2 Effects

- failure to achieve discharge consent ammonia standards. Fish are particularly sensitive to the concentration of ammonia in the effluent
- exceedence of EC Freshwater Fish Directive standards at Bleadney and Henley Hill on the River Axe (see Table 2)
- significant failure of RQO on the River Axe (see Table 1).

Options for action	Responsibility
Continue the programme to remove product in paper production which causes high ammonia, possibly completely by end 1997.	Mill operator
Monitor the recently improved biological treatment of effluent to ensure consent compliance.	Agency
Continue to reduce discharge. Effluent recirculation trials are underway to reduce discharge volume of effluent to the River Axe, but this must be done without increasing the ammonia concentration.	Mill operator

3.13 Issue - The impact of abandoned lead mines

3.13.1 Background

The Mendip Hills were once an important lead mining area although no mining takes place today. Lead is released into the environment in minewater drainage and in runoff from spoil heaps. Downstream from mining areas river sediments can contain lead and other metals. Disturbing these sediments can make the lead available in the environment again.

We have commissioned some work with Southampton University to look at the toxicity of river silt.

3.13.2 Effects

Abandoned lead mines caused exceedence of Surface Water Abstraction Directive standards at Cheddar Springs on the Cheddar Yeo (see Sections 5 and 25.2.5).

In the early 1970s some farm livestock was poisoned by heavy metal compounds in fields adjacent to the River Yeo following river maintenance works. Since that time, river maintenance operations have been carried out in a manner that assumes a major toxicity problem exists; this is costly and restricts the effective management of the river.

Options for action	Responsibility
Evaluate toxicity of river silt.	Agency
Review river maintenance and the environmental consequences of disturbing and disposing of river silts.	Agency

3.14 Issue - Development pressure

3.14.1 Background

The Agency is concerned that planned development within the catchment which includes the building of approximately 6,000 new houses by 2011 (see Section 16) 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 minimise the environmental impact of this development.

A major challenge posed by such development is to maintain the exceptional biodiversity and wildlife interest of the catchment whilst still maintaining a healthy local economy.

3.14.2 Effects

- an increase in the quantity of raw sewage requiring treatment which might lead to greater pollution load on watercourses (see Section 5)
- an increased demand for water for public supply, industry and agriculture (see Section 17)
- an increase in the quantity of waste requiring disposal (see Section 13)
- an increase in housing and infrastructure which will use up green field sites and change drainage regimes (see Section 16)
- 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 6, 13, 14 and 18).

Options for action	Responsibility
Work in partnership with local authorities to improve their environmental protection policies and work towards a more sustainable type of development.	Local Authorities, Agency
Enforce discharge consents and IPC authorizations, and where necessary review.	Agency
Work with WWSL to prioritize their expenditure at STWs.	Agency, WWSL
Work with water supply companies to prioritize expenditure on water resource management and development. Ensure Agency's demand management targets are met. See Issue 3.7.	Agency, Bristol Water, WWSL
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
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.	Local planning authorities, Agency, developers

Part 2

4. The Physical Environment

4.1 Geology

In the Carboniferous Limestone districts of the Mendips, the hard limestone is traversed by strong vertical joints which define the cliff profiles of deep gorges such as Cheddar Gorge. Limestone is highly soluble in water charged with carbon dioxide which results in streams reaching the limestone plunging underground through cavities known as 'swallets' or 'slockers'. After running through subterranean passages, the waters finally emerge in great springs such as those at Cheddar and Wookey Hole - the source of the River Axe. The low-lying land abutting the Mendips is the red Mercia Mudstone.

The River Brue rises 9 km to the east of Bruton and first flows west over impermeable silty clays. From here, the river crosses a limestone ridge which extends from Upton Noble in the north, past Redlynch, to Bratton. Immediately to the west of this ridge, the limestone crowns a low range of hills extending southwards, between which the river runs.

Further west again is a wide north-north-easterly trending belt of low-lying heavy clay land. The Rivers Axe and Brue both flow westwards to the sea through the flat landscapes of the peatlands and the estuarine alluvium (Somerset Levels and Moors).

4.2 Soils and agricultural land use

The coastal Levels are a strip of deep and stoneless calcareous clay soils over marine alluvium. Here the land is relatively flat, with groundwater controlled by pumps and ditches. The land here is slightly higher at approximately 6m OD than the inland peat Moors (4m OD on average) and so is less likely to suffer fluvial flooding. However, the Levels are generally below the High Water Spring Tide level (approximately 8m OD) and so are threatened by tidal flooding. The soils are suited to both permanent and short-term grassland, plus winter cereals.

Further inland the Moors consist of either deep organic peat soils derived from raised bog and fen peat in the Brue valley, or in the Axe Valley, deep stoneless humose clayey soils over marine alluvium and fen peat at depth. On the lower lying Moors the risk of flooding is greater than on the coastal Levels. Here there are also high groundwater tables. Water levels are controlled by ditches and pumping. There is also a risk of wind erosion where cultivation takes place on the peat soils. Cultivation also causes peat soils to shrink making them increasingly prone to flooding. Consequently for agriculture the area is best suited to dairying and stock-rearing on permanent pasture. (See Section 20).

The Mendip Hills in the north of the catchment have the characteristic scarp slope and plateau landform of Carboniferous Limestone. This underlying geology is associated with well-drained fine silty soils over clay on the plateau, with some pockets of fine reddish soils over rock. Shallow well-drained loamy soils over rock occur on the steeper scarp slopes. Soils on the plateau are suited to dairying on

short-term grassland, together with cereals and root crops. The steeper scarp slopes are limited to stock-rearing on the herb-rich grassland habitats of good grazing value.

The Polden Hills ridge to the south comprises shallow well-drained brashy calcareous clayey soils over Jurassic Limestone, whilst the foothills to the north share, with the Wedmore "island", deeper but more slowly permeable calcareous clayey soils. These soils are suited to both short-term and permanent grassland for dairying and stock-rearing on permanent and short-term grassland, together with some winter cereals.

4.3 Hydrology

The distribution of rainfall over the catchment is shown on Map 4. The range varies from more than 1000 mm per year over the Mendip Hills to less than 722 mm per year over the levels. The catchment rainfall (1961-90) is estimated at 944 mm per year. Discounting human influences such as abstraction, land drainage, storage and field irrigation, the computer modelled natural flow of water leaving the catchment should be 458 million litres per day on average.

The relative impermeability of the headwaters of the Brue catchment (see Section 4.4) has two major hydrological implications. Firstly, storm water runs off the land quickly and the river responds quickly to rainfall. Secondly, base flows are relatively small and in dry weather, river flow can reduce rapidly.

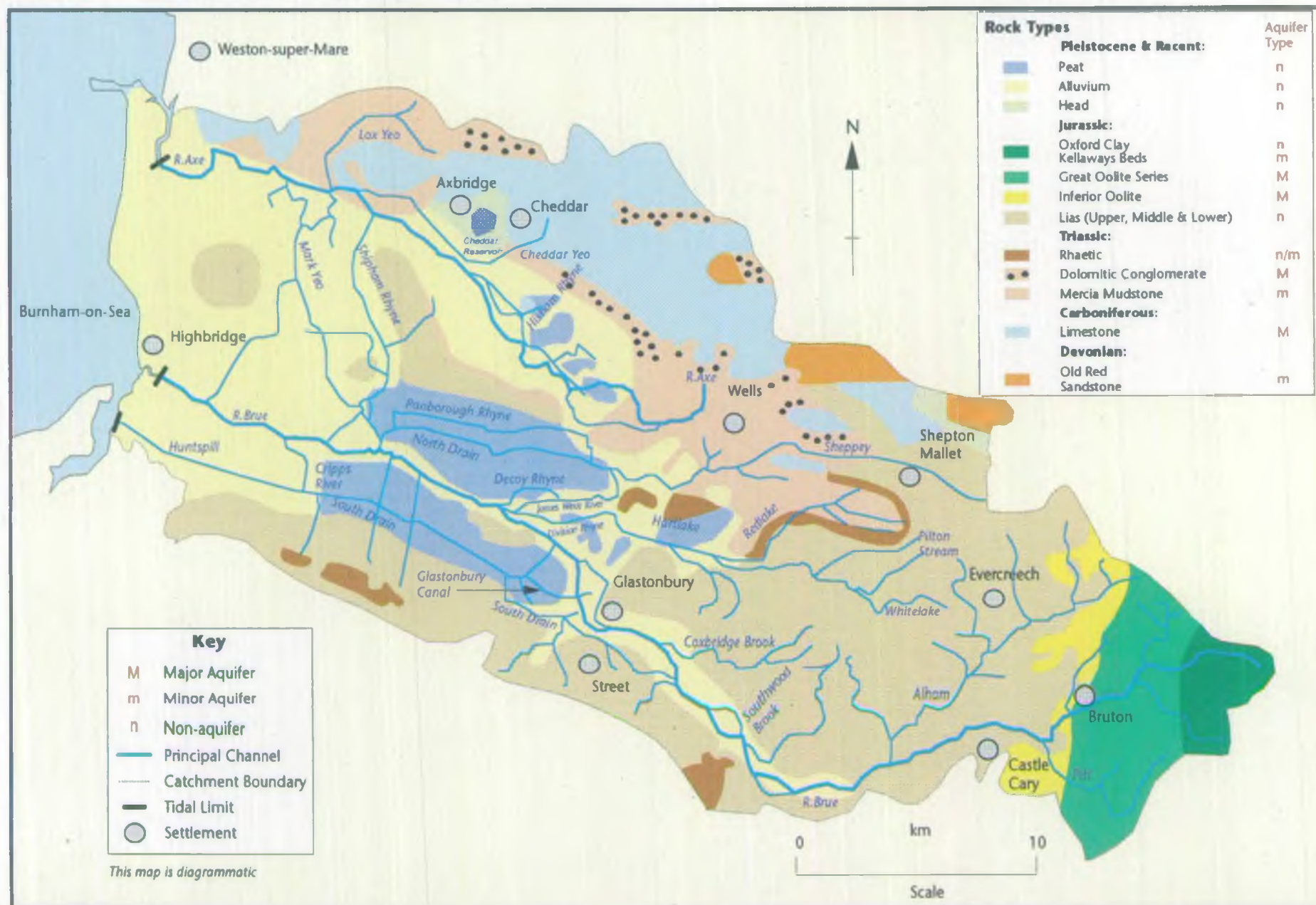
In the Mendip Hills, although stormwater readily percolates through the ground, groundwater is mainly controlled by large fissures and so the river responds fairly quickly to rainfall. However, high flows are attenuated by the Bristol Water Abstraction into Cheddar reservoir. Base flows are relatively small due to the limited storage capacity of the aquifer and hence river flows can reduce to relatively low values in dry weather.

4.4 Hydrogeology

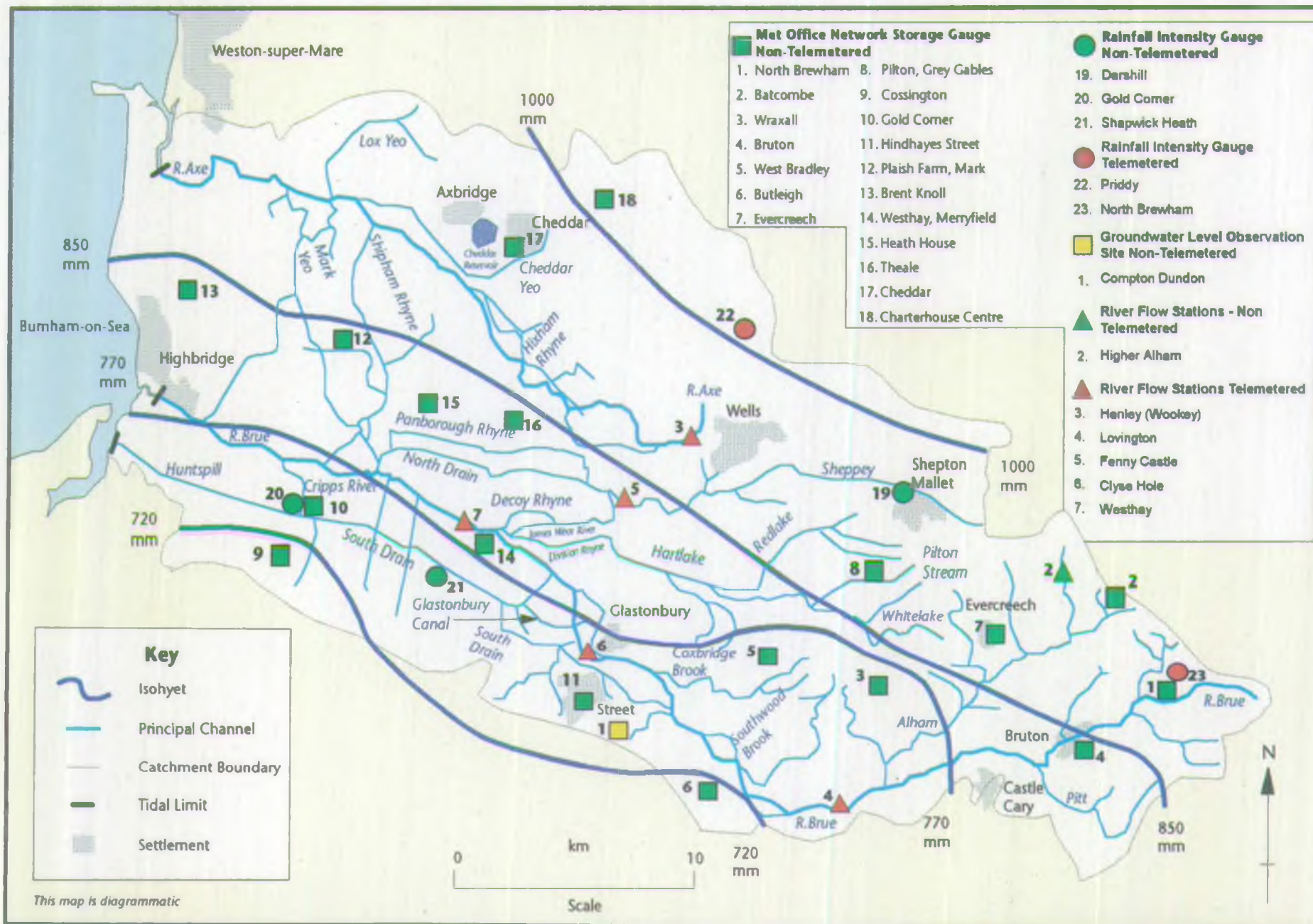
Major aquifers shown on Map 3 are often used for large potable supplies although the Carboniferous Limestone has very low groundwater storage capability and responds to inputs and abstractions with large water level changes. The Upper Axe and the Cheddar Yeo are maintained by spring flows during the summer. The Sheppey, with its reliable springs, contributes an important proportion to the summer base flows of the Lower Brue. As regards public water supplies, the Carboniferous Limestone, the Dolomitic Conglomerate and the Inferior Oolite are of particular importance, supporting seven public supplies from springs and four from boreholes. The three most major springs are found at Cheddar, Wookey Hole (the source of the River Axe which drains much of the southern area of the Mendips) and St Andrews Well at Wells. Areas of lower permeability have been classified as 'minor aquifer'. Areas considered to have negligible permeability, only supporting very minor abstractions; if any, have been classified as 'non aquifers'.

In times of drought, a river's baseflow may be the only water available to support aquatic life. It is, therefore, of paramount importance that we protect groundwater quantity as well as quality.

Map 3 Geology and Hydrogeology



Map 4 Hydrometric Network



5. The Quality of Surface Waters

5.1 Our Proposed Targets for River Water Quality

We manage 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 outlined below. More detail is available in Section 25.

We have proposed our RQOs using a classification scheme known as River Ecosystem (RE) which was introduced by the National Rivers Authority, following public consultation, in 1994. The RE classification comprises five hierarchical classes as summarised 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.

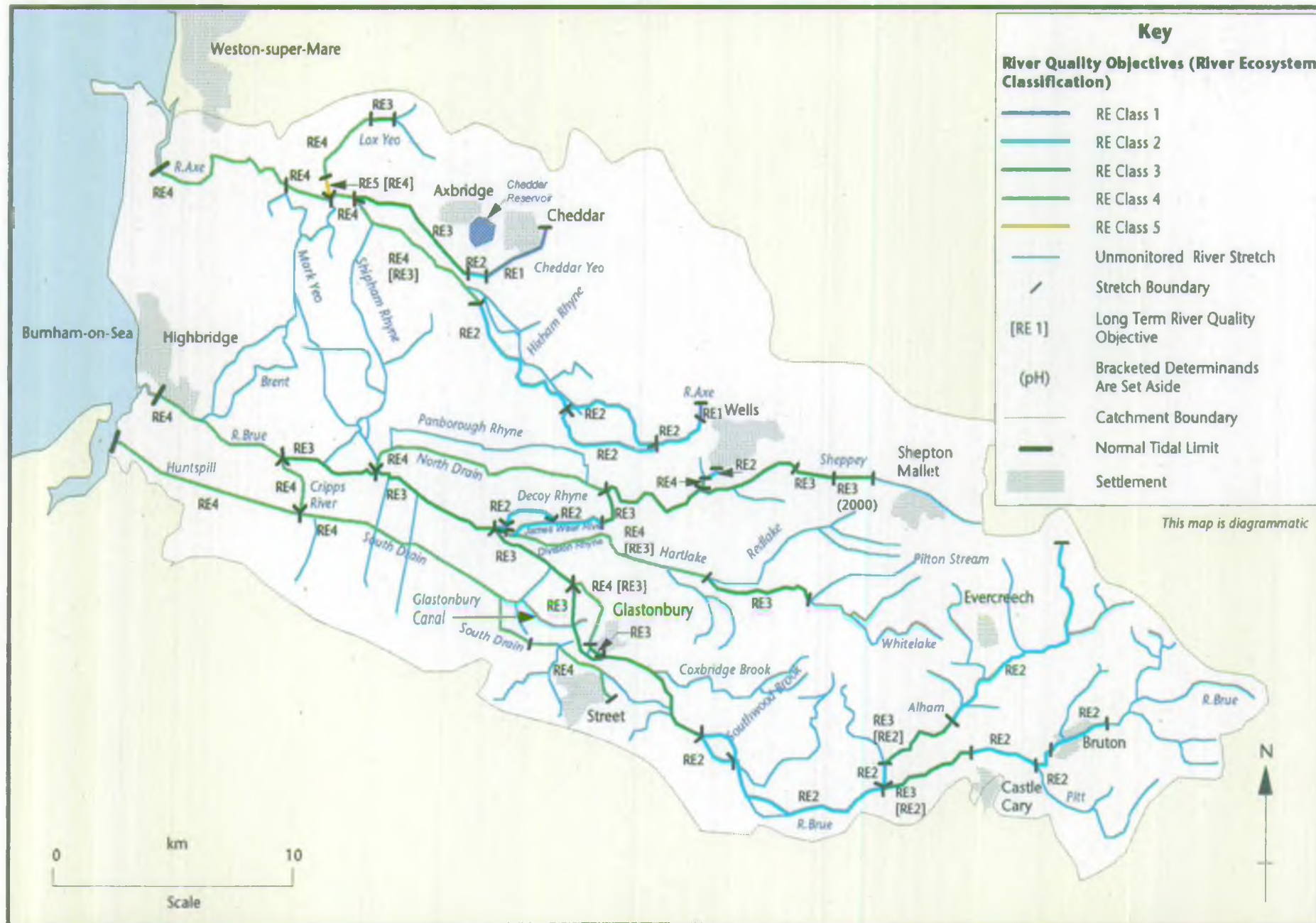
Where we are unable to identify solutions or resources to resolve current water quality problems, we can also set a Long Term RQO; we will test compliance against RQOs but use Long Term RQOs as a basis for setting consents for new discharges. This will ensure that future developments will not hinder our efforts to improve water quality.

The rivers of the Brue and Axe Catchment have been divided into 45 classified reaches and the RQOs that we intend to set are shown on Map 5.

Please comment on the River Quality Objectives that we propose.

This Section provides information on the RQOs proposed for the Brue and Axe Catchment and includes a map which details compliance with them. Where a stretch does not comply with the proposed RQO, the reasons are investigated and the necessary actions are taken to ensure compliance.

Map 5 Proposed River Quality Objectives (River Ecosystem Classification 1995)



5.2 River Quality Objectives

The water quality targets that we use for managing water quality are known as River Quality Objectives (RQOs); these are based on the River Ecosystem (RE) classification scheme, the target values that we are proposing to set are detailed in Section 5.1.

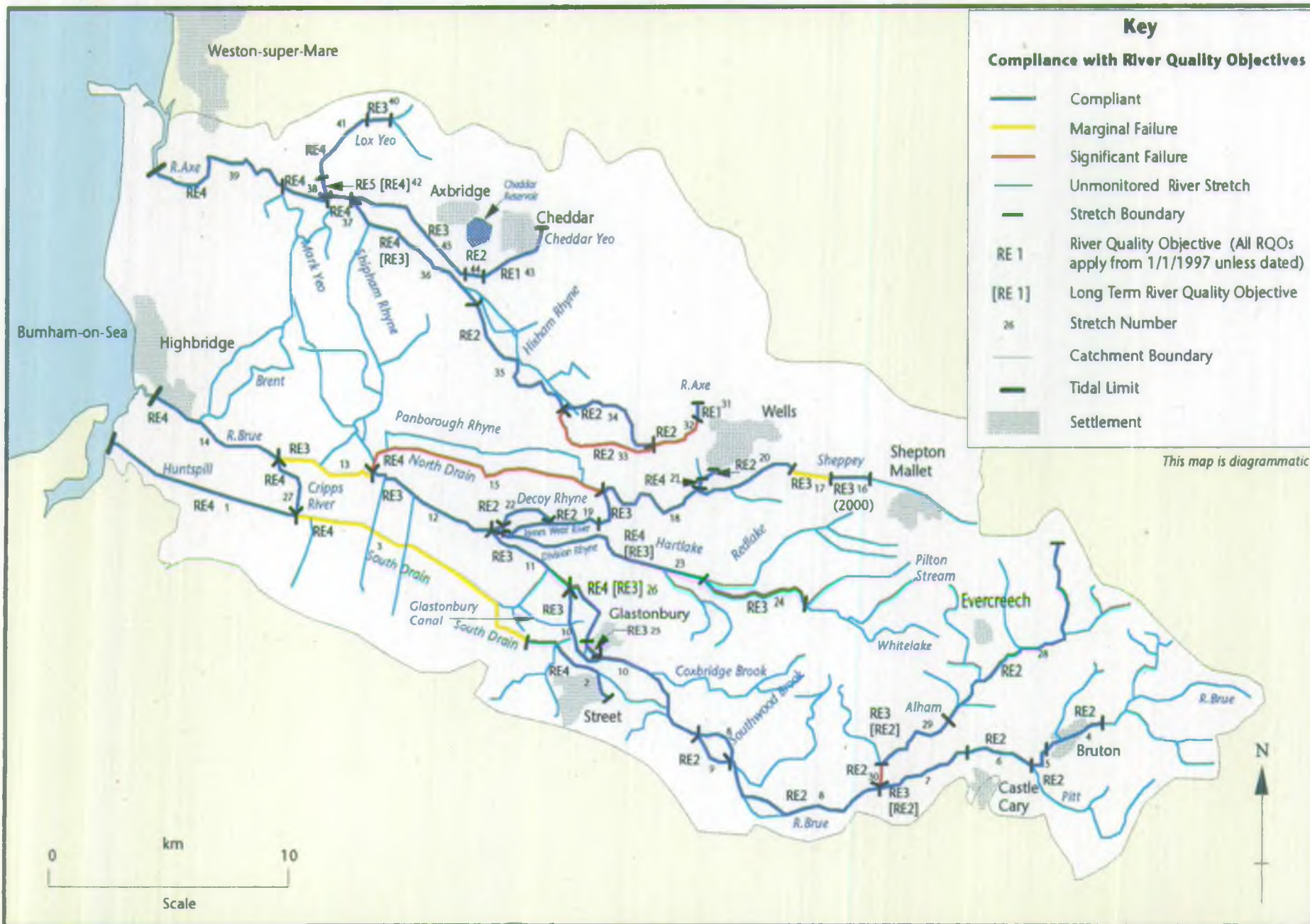
Map 6 and Table 1 show where current water quality fails to meet its RQO. This assessment is based on three years of routine monitoring data from the Public Register collected between 1993 and 1995. We have shown failures to meet RQO as *significant* and *marginal failures*. Significant failures are those where we are 95% certain that the river stretch has failed to meet its RQO. Marginal Failures are those where we are between 50% and 95% certain that the stretch has failed to meet its RQO.

Of the 45 monitored river stretches (200.4 km) in the Brue and Axe Catchment there are 4 stretches (19.2 km) which significantly fail to meet their RQO, and 5 stretches (26.7 km of river) which marginally fail to meet their current RQO. We have also assessed whether river stretches meet their long term RQO.

Table 1 Non-compliance with River Quality Objectives

River	Stretch Ref No.	Stretch Name	Reason for non-compliance
South Drain	3	Avalon Farm - Confluence with Gold Corner	Marginal failure due to low levels of dissolved oxygen. This watercourse is penned and during the summer is extremely slow flowing and suffers from algal growth. See Issue 3.1.
Brue	7	Wadham Farm Stream - Confluence with Alham	Marginal failure of long term RQO due to elevated biochemical oxygen demand. Low river flow could affect water quality in this stretch. See Issue 3.1.
Brue	13	Confluence with North Drain - Confluence with Cripps	Marginal failure due to low levels of dissolved oxygen. This stretch is slow flowing and the monitoring point is downstream of the North Drain which suffers from low dissolved oxygen. See Issue 3.1.
North Drain	15	Crossing with Sheppey - Confluence with Brue	Significant failure due to low levels of dissolved oxygen. A slow flowing channel causing low dissolved oxygen which is unlikely to improve. Problem may be exacerbated by farm inputs. EA maintenance practices contributed to this failure. See Issues 3.1 & 3.9.
Sheppey	16	Shepton Mallet STW - Croscombe STW	Marginal failure of dated RQO due to elevated biochemical oxygen demand. Shepton Mallet STW receives the effluent from a cider factory which in the past has affected the performance of the works. Drainage from the cider factory has also affected the River Sheppey in the past. See Issue 0.
Sheppey	17	Croscombe STW - Dulcote	Marginal failure due to elevated biochemical oxygen demand. Local farm improvements are anticipated for this stretch. See Issue 3.9.
Hartlake	23	Redlake/Whitelake Confluence - Confluence with Sheppey	Marginal failure of long term RQO due to low levels of dissolved oxygen. Partly due to long term problems of sewage disposal at North Wootton (Redlake) which does not have mains drainage. Hartlake is also affected by low river flows in summer. See Issues 3.1 & 0.
Alham	29	Snagg Farm - Confluence with Alham Tributary	Marginal failure of long term RQO due to elevated biochemical oxygen demand. The Alham valley is intensively farmed (cattle and pigs) and subject to runoff problems. See Issue 3.9.
Alham	30	Confluence with Alham Tributary - Confluence with Brue	Significant failure due to elevated biochemical oxygen demand. There are farm discharges and potential problems with agricultural runoff in the local area. See Issue 3.9.
Axe	32	Paper Mill - U/S Wookey Bifurcation	Significant failure due to high concentrations of unionised ammonia and total ammonia. St Cuthberts Paper Mill discharges ammonia into this stretch. See Issue 3.12.
Axe	33	U/S Wookey Bifurcation - D/S Wookey Bifurcation	Significant failure due to elevated levels of unionised ammonia and biochemical oxygen demand, and marginal failure due to elevated levels of total ammonia. Causes are St Cuthberts Paper Mill and several consented farm discharges which have now been improved. See Issues 3.9 & 3.12.
Axe	36	Clewer - Confluence with Cheddar Ye0	Marginal failure of long term RQO due to low levels of dissolved oxygen. Dissolved oxygen concentrations are low as a result of penning and algal growth in summer. There are at least 3 farms with consented discharges which may require review. See Issues 3.1 & 3.9.
Lox Ye0	42	Loxton - Confluence with Axe	Marginal failure of long term RQO due to low levels of dissolved oxygen. Loxton STW discharges into this stretch and has an impact on water quality in summer. A penned watercourse which has low river flows in the summer. See Issue 3.1.

Map 6 Compliance with Proposed River Quality Objectives (River Ecosystem Classification 1995)



Map 7 EC Directives Monitoring



5.3 EC Bathing Waters Directive - See Severn Estuary Strategy Joint Issues Report

5.4 Non-identified Bathing Waters - See Severn Estuary Strategy Joint Issues Report

5.5 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 (see Section 25.2.1).

Table 2 Non-compliance with imperative standards of the EC Freshwater Fish Directive

River	Stretch	Length (km)	Failing Determinands	Year	Reason for Failure
North Drain at Tealham Moor	Hurn Farm - Confluence with River Brue	10.1	Total ammonia Low Dissolved Oxygen	1993, 1994 1993, 1994	Algal blooms, pumping out of peat diggings, dredging, weedcutting, icing over in winter and possible farm runoff contributed to problem. See Issues 3.1, 3.8 & 3.9.
South Drain at Edington	Catcott Bridge - Gold Corner PS	4.6	Dissolved Oxygen	1994	Possibly isolated pollution incident due to Agency weedcutting.
River Brue at Cow Bridge	Baltonsborough - Cow Bridge Weir	4	Un-ionised ammonia Total ammonia	1993	Diffuse land runoff. See Issue 3.9.
River Alham above Evercreech STW	Higher Alham Farm - Confluence with Evercreech Stream	7.4	Total ammonia	1993	The monitoring point was within the mixing zone for an SSO. The monitoring point has now been moved upstream of the SSO.
River Axe at Henley Hill	Wookey Hole - Confluence of two branches	2.4	Un-ionised ammonia Total ammonia	1993 1994	Paper Mill breaching consent conditions. See Issue 3.12.
River Axe at Bleadney	Wookey Hole - Confluence of two branches	9.8	Un-ionised ammonia Total ammonia	1993 1994	Paper Mill breaching consent conditions. See Issue 3.12.

5.6 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 (see Section 25.2.4). This Directive requires Member States to identify waters that are or could be affected by pollution from nitrates. The land draining to these polluted waters must be designated as *nitrate vulnerable zones* (NVZ). Member States must establish action plans to reduce existing nitrate pollution and prevent further pollution. Outside NVZs, Member States must establish and promote a code of good agricultural practice.

The first NVZs were formally designated in 1996, and of six designated within this Region, one is within the area of this report, at Castle Cary. All the designations in the Region are in respect of groundwater sources. The first review of the existing zones and consideration of any new ones is to be completed during 1997. Regular reviews of existing and potential new NVZs will then be at four year intervals. First indications are that additional zones may be designated in the study area, however, the formal assessment will not be completed until after this publication.

We are responsible for advising on the selection of catchment boundaries of NVZs. The actual field boundaries are chosen by MAFF. The designation of NVZs and agricultural measures to be adopted is the responsibility of Government. Part of an NVZ at Castle Cary (see Map 7) falls within the Brue and Axe Catchment.

5.7 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 imperative standards that must be achieved, and guideline standards that Member States should aim to achieve, for water for public supply which is to be given different levels of treatment (see 25.2.5). We are responsible for monitoring the quality of designated surface water abstractions and reporting the results to DoE 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.

In 1993 there were three identified Surface Water Abstraction points in the Brue and Axe Catchment: Cheddar Yeo, Cheddar Caves; Cheddar Reservoir; and River Axe, Cradle Bridge. In 1994 the North Wessex Surface Water Abstraction Directive monitoring network was reviewed. The point at Cheddar Yeo, Cheddar Caves was removed from the monitoring network and a new point at Cheddar Yeo, Cheddar Springs which was closer to the abstraction point was monitored instead. The point on the River Axe at Cradle Bridge was removed from the monitoring network as this abstraction is pumped to Cheddar Reservoir. In 1995 there were two identified Surface Water Abstraction points in the Brue and Axe Catchment: Cheddar Yeo, Cheddar Springs and Cheddar Reservoir.

Table 3 EC Surface Water Abstraction Directive: details of non-compliance

Site	Reason for Failure	Possible Causes of Failure
Cheddar Reservoir ST44655350	Nitrate: 1993	Problems could have been associated with confusion over sampling point locations.
Cheddar Yeo, Cheddar Springs ST46505390	Lead: 1994, 1995	Investigation concluded that abandoned lead mines in the area caused this failure See Issue 3.13.

5.8 EC Dangerous Substances Directive

The EC Dangerous Substances 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 DoE 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.

We monitor one designated site for List I substances in the Brue and Axe Catchment. Downstream of Wells STW is a receiving waters monitoring site for cadmium. This site has been monitored since 1993 and there have been no EQS exceedences. Wells STW received a consented trade discharge from Thorn EMI. In 1995 Thorn EMI no longer handled cadmium at their works. Wells STW was never consented for cadmium as significant levels were not detected in the effluent. Monitoring of the receiving waters will continue until the end of 1997, two years after the discharge to Wells STW ceased to contain cadmium.

We also monitor another designated site for List II substances. Downstream of the Old Argyle Foods Depot is a receiving waters monitoring site for iron and pH. There have been no EQS exceedences at this site in the period 1993 to 1995. The discharge from Old Argyle Foods Depot is consented for iron and pH.

5.9 EC Urban Waste Water Treatment Directive

See Section 5.9 and Severn Estuary Strategy Joint Issues Report.

5.10 EC Shellfish Waters Directive

There are no designated shell fisheries in this catchment.

5.11 EC Shellfish Hygiene Directive

There are no designated shellfish hygiene sites in this catchment.

5.12 Bioaccumulation

We have carried out an annual monitoring programme which measures the levels of metals and organic residues in limpets and seaweed to provide information on the levels and bioavailability of these pollutants.

Sites monitored within the catchment are covered in the Severn Estuary Strategy Joint Issues Report.

5.12 Biological Classification

We monitor the ecological quality of rivers by sampling the benthic aquatic macro invertebrates. These are small animals that live in river sediments or on stones in the river. They are unable to move far and so are affected by the long term conditions in the river as compared with chemical quality which indicates more short term variability. The classification is based on what could be expected for that particular type of river. Class 'a' indicates the ecological health expected where conditions are ideal. The lower classes indicate a progressive worsening of ecological health as conditions such as physical habitat and chemical water quality become more degraded. We use this biological information to classify rivers using our biology classification scheme. See Table 4.

Table 4 Biological Class Descriptions

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

During the 1995 biological survey, 43 sites in the Brue and Axe Catchment were sampled. Of these, 25 (58.1%) achieved class a, 15 (34.9%) class b and 3 (7.0%) class c. No sites were classed d, e or f.

The Sheppey downstream of Shepton Mallet was graded as class c. This result is lower than expected and is believed to be due to the impact of Shepton Mallet sewage treatment works; discharges arising from cider production in the town can raise the biochemical oxygen demand (BOD) of the treated effluent at certain times of the year.

The lower reaches of the Huntspill also achieved only class c. In this case, although the sampling site was located near the seaward end of the reach, and hence potentially subject to saline intrusion, there is evidence of significant algal activity during summer penning. This is likely to have caused the relatively poor results due to the impact on BOD and dissolved oxygen.

Some sites in the lower Axe catchment show signs of eutrophication with extensive coverings of blanketweed (*Cladophora*) or duckweed (*Lemna*). In 1995, the Axe at Lower Weare and the Lox Yeo at

Loxton were particularly affected. There are regular algal blooms in many of the slower flowing water courses, and in March 1996, a notifiable blue-green algal bloom occurred in a cut-off channel of the Axe near Bleadon, a further indication of significant nutrient enrichment.

Of the three sites in class C one has been downgraded from class A since the 1990 survey. This site, on the Cheddar Yeo upstream of Cheddar STW, was dredged as part of the flood defence maintenance programme during 1995. The downgrade is believed to reflect the biological impact of such work rather than an effect of poor water quality.

In contrast, improvements in biological water quality have been achieved in some areas since 1990. Three reaches in the Brue Catchment downstream of Glastonbury to the confluence with the Cripps River have been upgraded, and the quality of the Glastonbury Mill Stream has improved. There was an upgrade on the South Drain from Westhay Heath to the Confluence with Gold Corner.

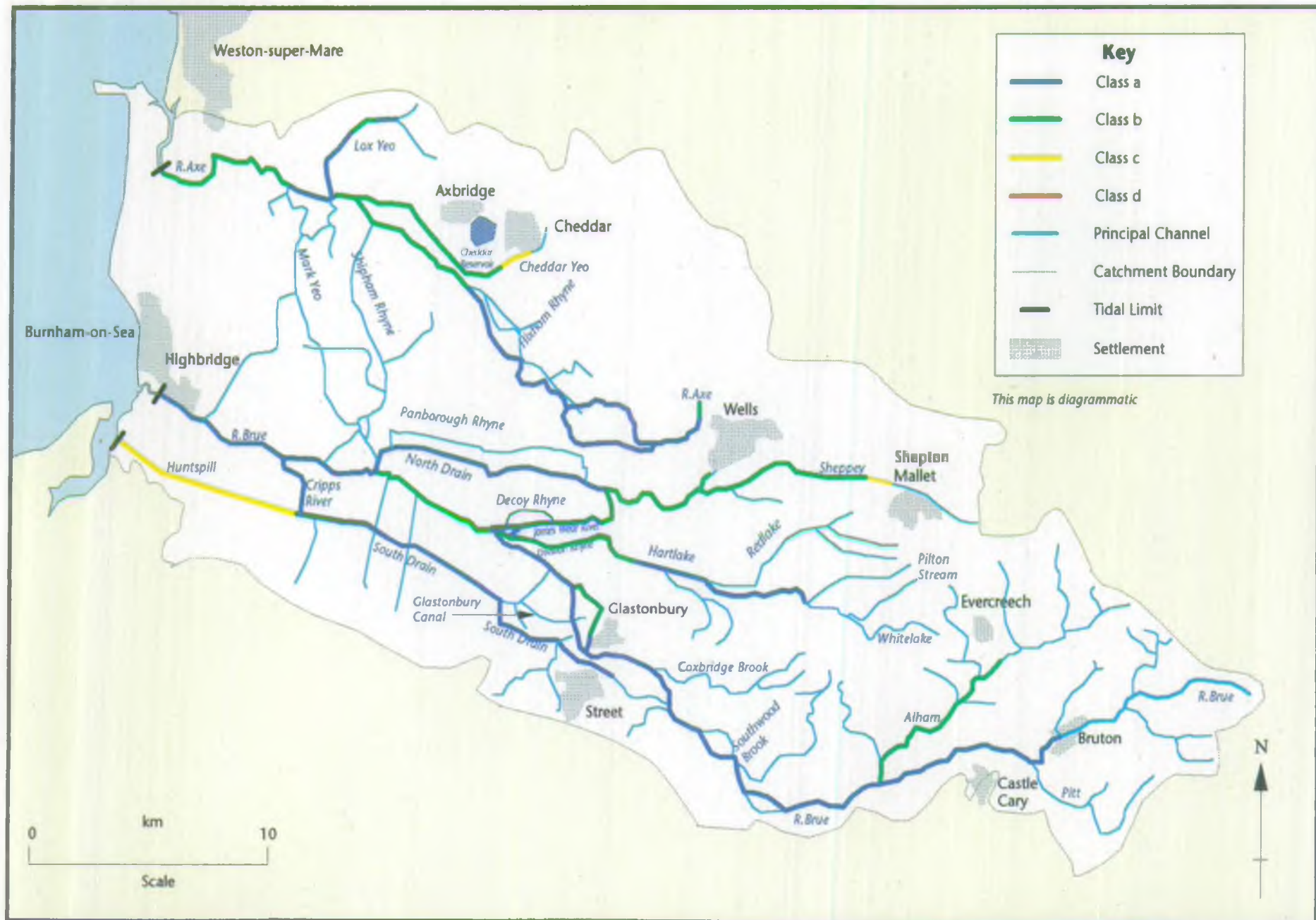
Many sites achieved a higher biological class than chemical class. For example, the South Drain achieved biological class a throughout, but only class c, and as low as class e on two reaches, for chemistry. At no site was the chemistry classed better than biology. These results reflect the fundamental differences in approach of the two classification schemes.

Subsequent work has targeted water quality problems, and some of those areas where gaps remained in the biological information. Locations for these surveys have included:

River Pitt (Pitcombe), Sheppey (Shepton Mallet), Blackford Brook (Blackford), Whitelake (Glastonbury), Redlake (North Wootton), Keward Brook (Wells), Alham (Batcombe) and the Brue (South Brewham and Cogley Wood).

Work will continue where results have proved inconclusive and problems remain unresolved.

Map 8 Biological Water Quality



5.13 Groundwater Protection

The protection of aquifers from pollution is of great importance, as the contamination of groundwater may put public supplies at risk. Contamination of groundwater may impact on river water quality where the baseflow is entirely 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:

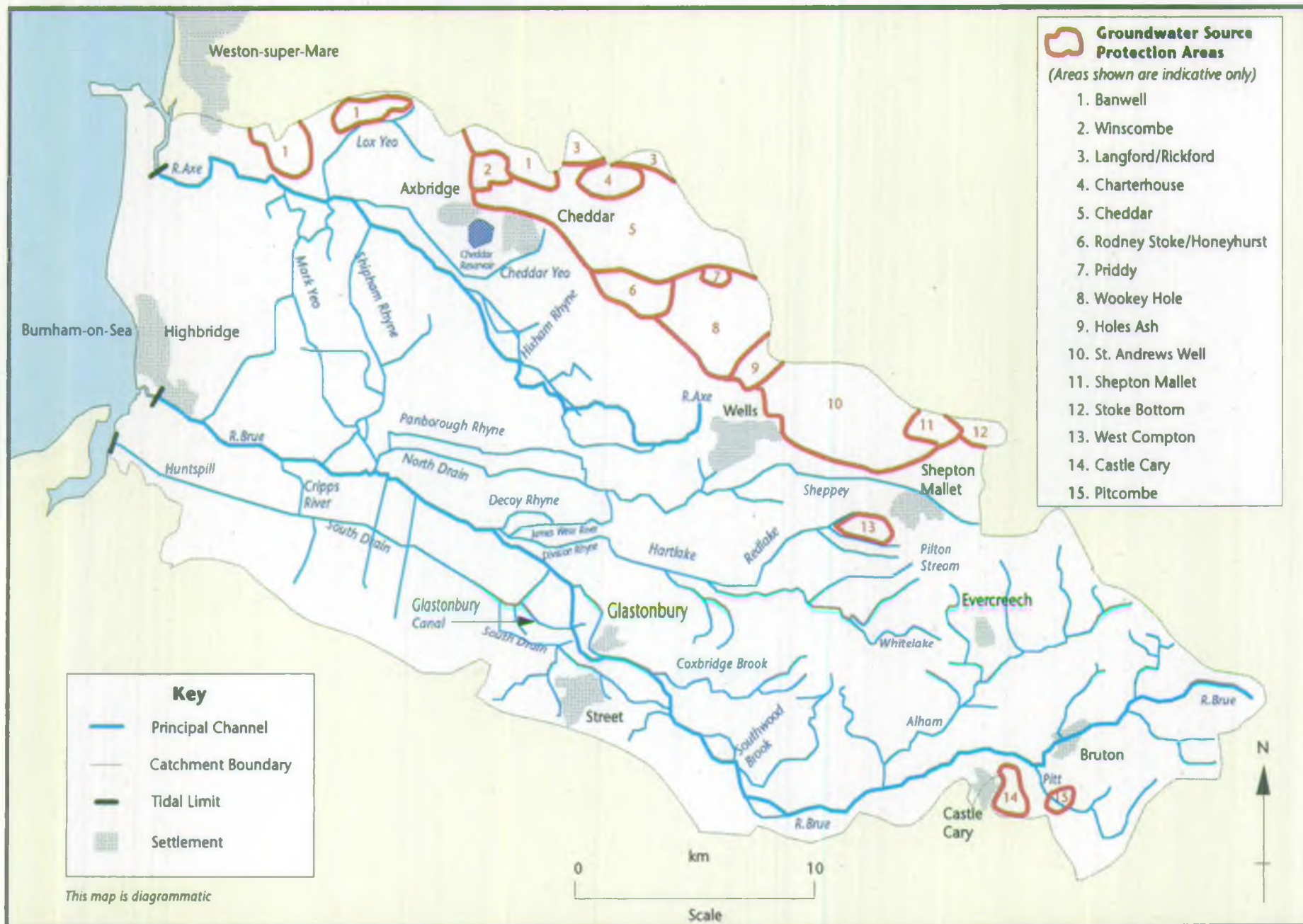
- physical disturbance of aquifers affecting quality and quantity
- waste disposal to land
- contaminated land
- disposal of sludges and slurries to land
- diffuse pollution
- other activities affecting groundwater quality.

We commit substantial resources to groundwater protection, and apply the PPPG through our own authorizations (discharge consents and abstraction licences). We also seek to protect groundwater quality in our role as a statutory consultee to the planning authorities.

The document describes the principles of Groundwater Vulnerability and Source Protection Areas, 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, bottling or food processing, 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. (See Map 9).

Map 9 Groundwater Source Protection Areas



6. 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, ambient levels of these pollutants are generally lower in the South West of England than in many other parts of England and Wales.

The Environment Agency has published *The Environment of England and Wales - A Snapshot* which contains information on air quality in the UK.

6.1 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 556677 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 such as Somerset County Council Scientific Services mobile monitoring station, passive diffusion tubes and dust deposition gauges. A continuous fixed monitoring site is operated by Sedgemoor District Council in central Bridgwater for sulphur dioxide and smoke measurements; this provides data to the UK's national air pollution monitoring network, along with passive tube data obtained for nitrogen dioxide. A new continuous fixed ozone monitoring site has been operated by South Somerset District Council since April 1996 at a rural location near Somerton; this also supplies national network data for this pollutant. (N.B. These sites are the nearest to the Brue and Axe Catchment. There are no monitoring sites within the catchment.)

The Institute of Terrestrial Ecology is carrying out a national monitoring programme for atmospheric Ammonia. This is to obtain a more accurate assessment of potential aerial nitrogen deposition, an important factor in the long term degradation of nutrient-poor wildlife sites. From 1996, monitoring sites within the Catchment near Priddy and Castle Cary have been operated by Somerset Wildlife Trust staff.

6.2 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 measures it expects others to take to see that objectives are met.

The strategy was published for consultation in the summer of 1996. The local authorities are the lead authority on air quality. We will be working closely with local authorities to help achieve the objectives of the National Air Quality Strategy, principally through Integrated Pollution Control (IPC) our regulation of emissions to air from controlled ("Part A") industrial processes. (See Section 21). Local authorities are responsible for the regulation of smaller, less complex "Part B" industrial processes as well as road traffic management.

6.3 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 this area.

6.4 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.

Local authorities are the appropriate authority to regulate traffic and have responsibility and Local Air Quality Management Plans (see Section 6.3). 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.

A rural ozone monitoring station in the adjacent Parrett Catchment near Somerton came on-line for the 1996 summer. Results obtained so far are summarized below and are considered typical of locations in Southern England.

Table 5 Ground Level Ozone Concentrations at Somerton

Number of days in 1996 when running 8 hour averages exceeded recommended AQS of 50 ppb					
April	May	June	July	August	Total
2	4	11	8	11	36
Highest running 8 hour average in 1996 - 84.3 ppb (at 1800 hours 21/7/96).					
Hourly mean for summer 1996 (1 April to 30 September) - 31.5 ppb.					
Source of data - South Somerset District Council					

6.5 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.

6.6 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 Parrett Catchment, at central Bridgwater are given in Table 6.

Table 6 Sulphur Dioxide Annual Mean Concentrations, Bridgwater

Sulphur Dioxide Annual Mean Concentration, parts per billion (ppb)									
86/7	87/8	88/9	89/90	90/1	91/2	92/3	93/4	94/5	95/6
7.8	9.3	10.1	12.7	11.6	8.6	12.4	11.6	4.6	8.5
(Source of data: Sedgemoor District Council and "Air Quality A to Z", June 1995, Meteorological Office and Air Quality Division, DoE. ISBN 0 86180 317 5.)									

6.7 Nitrogen Dioxide

Nitrogen dioxide is also toxic to plants and humans. Concentrations are subject to the EC Directive Air Quality Standards for Nitrogen Dioxide (85/203EEC) 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 and is therefore unlikely to be exceeded in the catchment.

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

6.8 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 lightening 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 neutralise 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 UN Economic Commission for Europe (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 SO₂ emissions by 80% by 2010 from a 1980 baseline. See Map 10 for projected modelled sulphur deposition between 1995 and 2005.

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 (as illustrated on 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.

There are no breaches of air quality standards known to be caused by authorized Integrated Pollution Control (IPC) processes in the catchment (See Section 21). However, two minor local air quality issues which have caused public comment or complaint are noted in Table 7.

Table 7 Local Air Quality Issues Causing Complaint

Site	Local Issue causing complaint
Royal Ordnance Plc, Puriton	Burning of waste explosives. This activity is necessary under the Explosives Act for safety reasons. It is excluded from IPC, but the factory management seek to minimize smoke caused and respond positively to occasional complaints.
ICI Polyurethanes, Shepton Mallet	Very occasionally smells of solvents from processes. IPC authorized and the company is actively addressing the issue.

7. Landscape

The landscape character of the catchment is essentially rural, and is dominated by the dramatic ridge of the Mendip Hills, which is designated as an Area of Outstanding Natural Beauty (AONB). To the south the catchment is bounded by the gentler Polden Hills ridge. A landscape assessment of the AONB has been produced for the AONB Joint Advisory Committee, who are also preparing a management strategy for the area. These documents are due for publication in 1997.

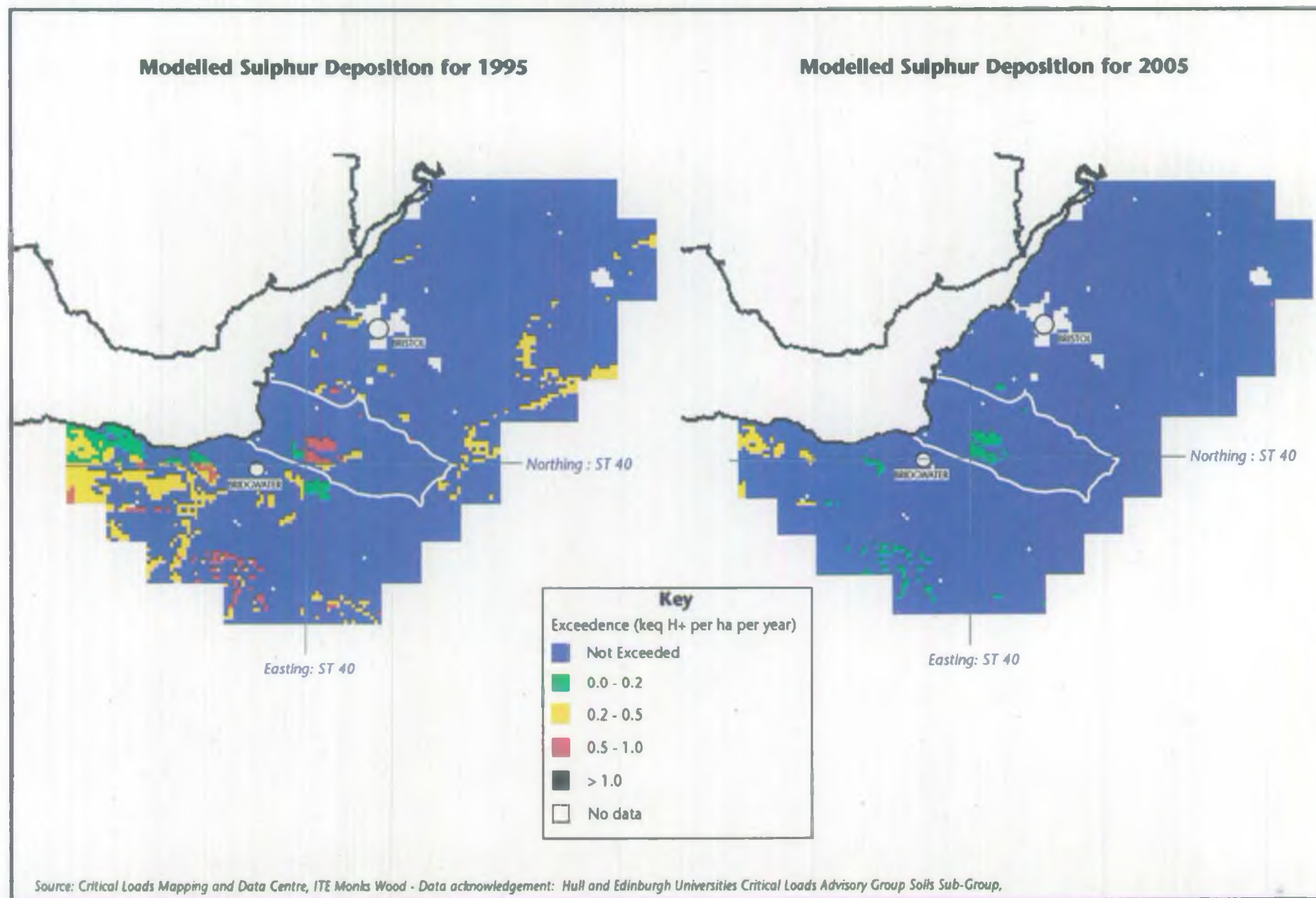
The catchment forms the northern part of the Somerset Levels and Moors Environmentally Sensitive Area (ESA) which is an extensive area of low-lying flat land creating a basin between the Mendip Hills to the north and the Blackdowns and Quantock Hills to the south and south-west. The Levels are a continuous flat belt of clay running parallel to the coast. The ESA mainly relates to the inland moors, a series of lower-lying valleys of peat and alluvium. The ESA was designated in 1987 with the primary objectives of maintaining the wetland landscape, wildlife and archaeology. A landscape assessment was carried out by MAFF in 1990 describing six character types: Open Moor; Semi Open Moor; Bushy Moor; Domesticated Moor; Hillocks and Disturbed Moor. (Reference Somerset Levels and Moors Landscape Assessment for monitoring, July 1990, MAFF).

At the local level, extensive areas of the catchment are designated as Special Landscape Areas (SLA) to which certain County Structure Plan policies apply. The plan recognises the need to safeguard the visual character of these areas through the control of development.

For more detail, reference to the following documents is recommended: Somerset County Structure Plan, Sedgemoor and Mendip District Wide Local Plans. The New Map of England: a celebration of the South West landscape, Countryside Commission, 1994.

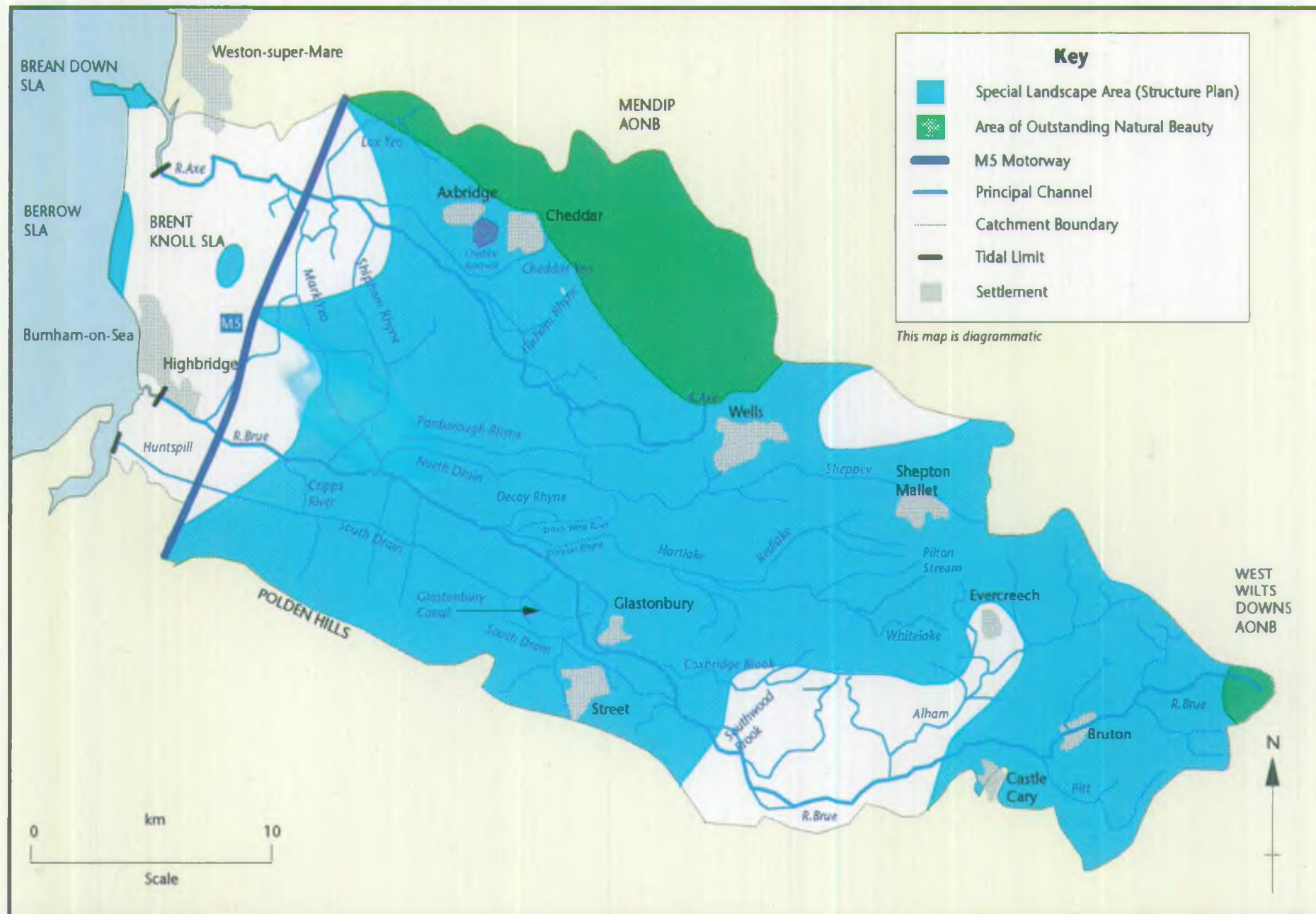
Under the Natural Area and Countryside Character Programme being developed by EN and the Countryside Commission, the Brue Catchment encompasses parts of the Mendip Natural Area and the Somerset Levels and Moors Natural Area, with a section of the mid-Somerset Hills. Core profiles highlighting the key landscape and wildlife features and issues are being prepared by these organisations, and will be publicly available.

Map 10 Exceedences of Critical Loads of Acidity for Soils

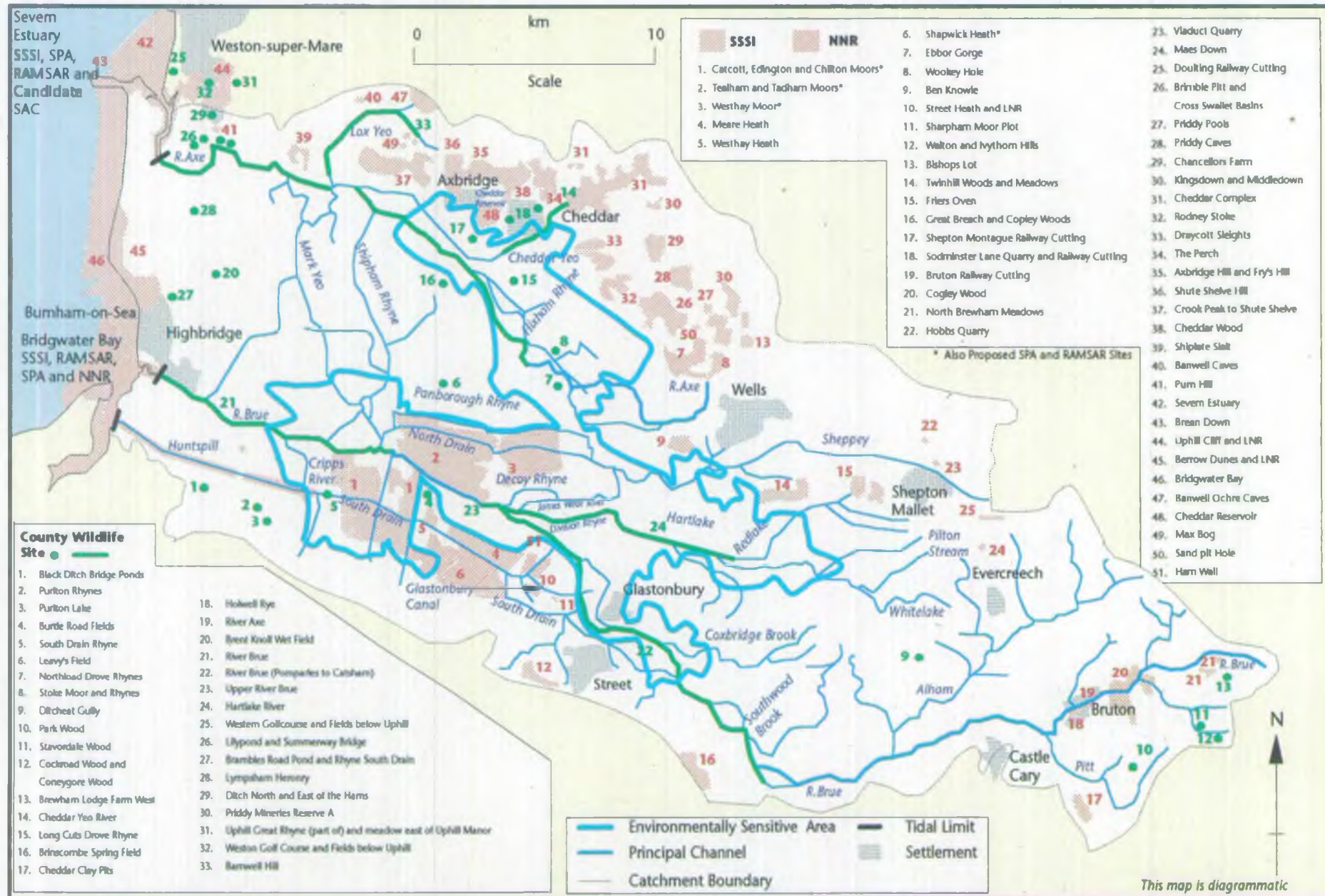


Source: Critical Loads Mapping and Data Centre, ITE Monks Wood - Data acknowledgement: Hull and Edinburgh Universities Critical Loads Advisory Group Soils Sub-Group,

Map 11 Designated Landscapes



Map 12 Conservation Resource 1

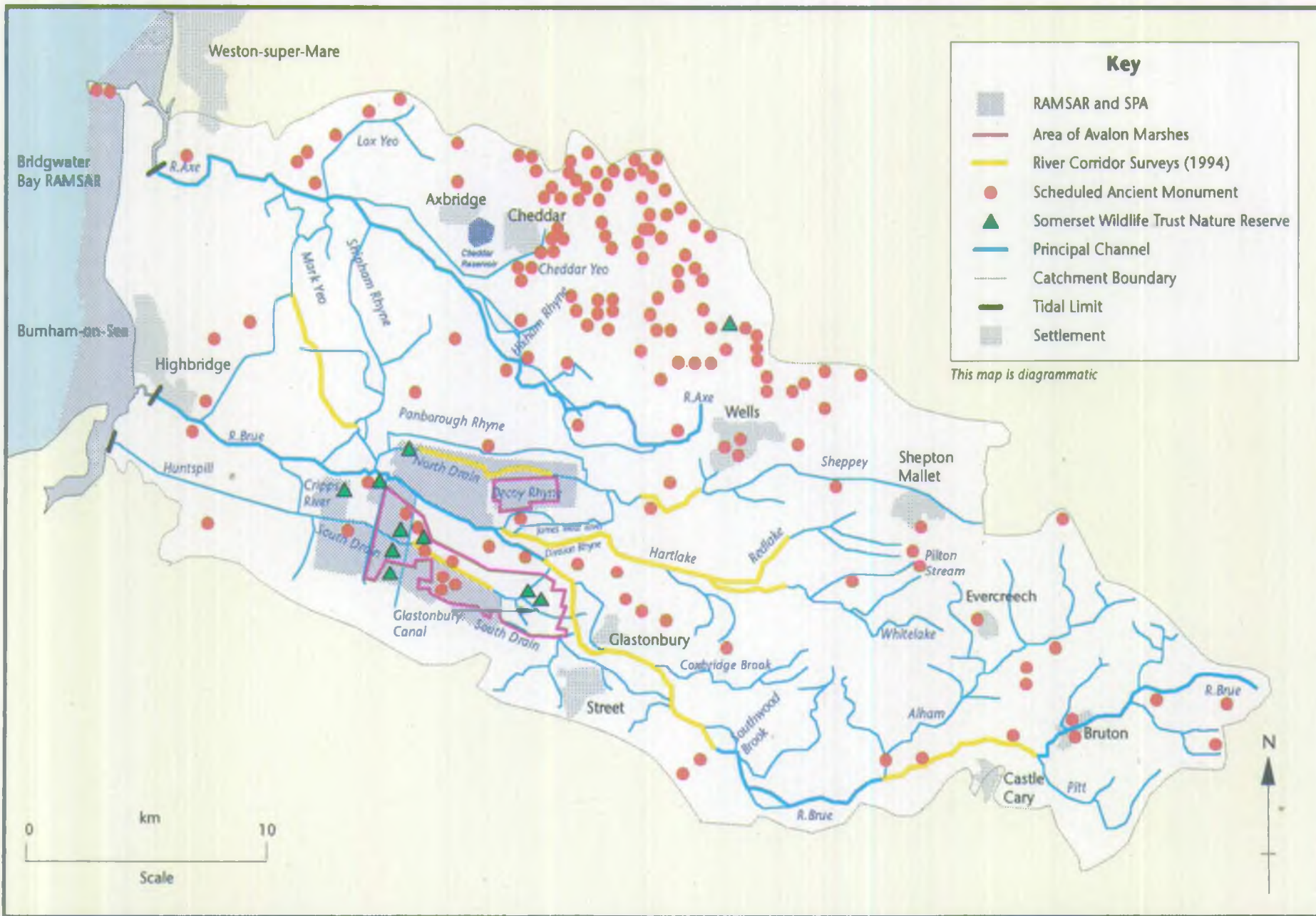


Information correct as of June 1997

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Brue and Axe Local Environment Agency Plan
Environment Agency

Map 13 Conservation Resource 2



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Brue and Axe Local Environment Agency Plan
Environment Agency

8. Wildlife

Here we consider how we protect and manage the natural environment associated with rivers and wetlands. We have duties to conserve and enhance wildlife, especially in rivers and wetlands; these are fulfilled through the work of other functions. However, we have a general duty to promote conservation, particularly in the aquatic environment. An important part of our work is to influence landuse planners and land managers to look after rivers and wetlands sensitively.

The value of the natural heritage within the catchment is particularly high; this is reflected in the presence of landscapes, habitats and historical artefacts which are designated at international, national and local levels.

8.1 Designated Areas

The Brue and Axe Catchment is of outstanding importance for nature conservation and contains some of the finest wetlands in South West England.

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

The Somerset Levels and Moors is a proposed Special Protection Area (SPA) under the EC Directive on the Conservation of Wild Birds. It is also a proposed RAMSAR site as a wetland of international importance supporting an outstanding assemblage of rare invertebrates, particularly water beetles, and internationally important numbers of wintering waterfowl. Bridgwater Bay coastal area, which extends along the Huntspill River is part of the Severn Estuary SPA and RAMSAR site. (See Map 12).

There are fifty-one Sites of Special Scientific Interest (SSSIs), a number of which contain important wetland habitats. SSSIs within the Brue catchment which form part of the proposed SPA include: Catcott, Edington and Chilton Moors; Tealham and Tadham; Westhay Moor; Westhay Heath; and Shapwick Heath. (See Map 12).

There are seven National Nature Reserves (NNRs): Shapwick Heath; Ham Wall; Westhay Moor; Bridgwater Bay; Ebbor Gorge; Somerset Levels and Moors (part); and Rodney Stoke.

County wildlife sites (CWS) are non-statutory sites, representing the best remaining areas of semi-natural habitat in the County. Thirty-three wetland sites have been designated as County Wildlife Sites (See Map 12). Policies in Local Plans strengthen protection measures for these sites.

A number of these important sites, including a number of high quality wetland nature reserves allow public access.

Part of the Somerset Levels and Moors ESA is located within the Brue and Axe Catchment. ESAs are designated by MAFF to encourage traditional farming methods and conserve and enhance the ecology, landscape and historic features of the area.

8.2 Somerset Levels and Moors Water Level Management and Nature Conservation Strategy

This strategy was launched in February 1992 by the NRA to safeguard the special wetland interest of the Somerset Levels and Moors. A primary target is to provide core areas where shallow winter flooding will create feeding sites for wintering waterfowl and suitable conditions in spring and early summer for breeding waders. English Nature has identified a list of priority SSSIs for attention: those included in the Brue catchment are Catcott, Edington and Chilton Moors, and Tealham and Tadham Moors. Ninety-two hectares of Raised Water Level Areas have been engineered within these sites to date.

8.3 Water Level Management Plans

Two sites within the catchment have been identified as of the highest priority for the development of Water Level Management Plans: Tealham and Tadham Moor; and Catcott, Edington and Chilton Moors. This initiative, promoted by MAFF and involving detailed discussions between the Agency, Internal Drainage Boards (IDBs), English Nature and landowners, will seek to agree the management of water levels to satisfy the interests of those dependant on appropriate management of water levels. In developing these plans there is to be a presumption in favour of positive water level management for Nature Conservation. We have identified stretches of watercourses where water levels critically affect the ecology of adjacent land, (see Map 14).

8.4 Prime Biodiversity Areas

A recent biodiversity analysis for the Mendip District indicates Prime Biodiversity Areas at Westhay Moor, Rodney Stoke, Wookey Hole and Butleigh and Copley (see Mendip Biodiversity Action Plan, commissioned by Somerset Environmental Records Centre (SERC), 1995). See English Nature's Natural Area profile for the Somerset Levels and Moors which identifies the Brue valley as a possible Prime Biodiversity Area.

8.5 Habitats

English Nature has recently divided the country into Natural Areas on the basis of land use and ecology. Key habitats have also been identified. The most significant types closely linked to the water environment in the Brue catchment are: Lowland wet grassland and fen meadows such as those at Shapwick Heath; ditches and rhynes on the Levels and Moors; the remnant mires and reedbeds within the Avalon Marshes area; open water (lakes and ponds); alder and willow carr; marshy grassland; a variety of river types; and the tufa springs and streams rising in the Mendip Hills. Coastal habitats of importance include the Brue and Axe estuaries with salt marshes and tidal mudflats, and dune systems, such as those at Brean and Berrow.

River corridor surveys to record habitat type and quality have been carried out on the River Brue and North Drain, (see Map 13). Habitat quality has been degraded where channels have been straightened or diverted, (see Map 15). We have identified those stretches of river where rehabilitation or a change of management methods would improve the river habitats, (see Map 16). Note that most of the areas suitable for enhancement are also those where channels are man-made.

8.6 Avalon Marshes

An extensive programme of wetland restoration is being undertaken within the Peat Production Zone, now known as the Avalon Marshes Project, (see Map 21). The principal agents are Somerset County Council (as Mineral Planning Authority), English Nature, the RSPB and Somerset Wildlife Trust. Landowners are encouraged to restore their peat workings to a wetland compatible after-use, using MAFF Countryside Stewardship Grants. The Agency has a regulatory role here, and has commissioned a hydrological study of the water balance within the Brue catchment to assist in the process of determining consent applications.

For more detail see Peat Local Plan. Somerset County Council Minerals Plan. Avalon Marshes - Countryside Stewardship Special Project Proposal, Somerset County Council et al, 1996.

8.7 Species

Species where the Agency is able to make an input to their conservation. Much survey work has been carried out within the catchment. Water voles have been recorded in very few locations, with records for the Cheddar Yeo and around Glastonbury. The Somerset Levels provide an extensive area of apparently suitable habitat with little evidence of occupation by water voles. It is about to become a protected species. (Reference: The Water Vole (*Arvicola terrestris*) in Britain 1989-1990: Its Distribution and Changing Status, The Vincent Wildlife Trust). This may be due to intensive maintenance regimes and extensive regular winter flooding. We have supported Somerset Wildlife Trust (SWT) and Somerset Environmental Records Centre (SERC) in a survey of the status and distribution of this rapidly declining species. The database will be regularly updated as resources allow.

Barn owl projects on the Huntspill river and South Drain incorporate nest boxes erected in 1992 funded by the Agency and the Hawk & Owl Trust. Continued monitoring shows that barn owls are beginning to use the boxes for breeding.

Otters are fully protected under the Wildlife and Countryside Act 1981 and listed in Annexe II of the EC Habitats Directive. Otters have been recorded in many parts of the catchment, with a particular stronghold in the Somerset Levels and Moors. The lack of otter records for the eastern part of the catchment may be due to the shortage of eels within this area. Agency maintenance operatives report a decline in eels. The otter population in the South West Region appears to be recovering from the massive decline of the 1960s/70s and this may result in migration to adjacent catchments. Several road casualties have been reported recently, providing useful information on pollutants and accident black spots.

Several notable invertebrates occur within the catchment. The nationally scarce hairy dragonfly and variable damselfly occur in numerous locations. The small red damselfly used to breed in the peat production area until the early 1970s. The legally protected lesser silver diving beetle is now confined to the peat moors in the Brue basin. The Red Data Book large marsh grasshopper is another nationally rare species which is found at Shapwick Heath, as is the marsh fritillary butterfly - this species is protected under Annexe II of the Bern Convention and is declining rapidly.

Within the catchment the Levels and Moors provide vitally important roosting, feeding and nesting sites for a wide range of birds. In winter, waterfowl such as the golden plover, lapwing, snipe and dunlin feed on wet grassland; whilst under flood conditions wildfowl such as teal, wigeon and mallard move onto the moors. Many of the pastures remain moist into the spring and early summer when they support breeding snipe, lapwing, curlew and a few pairs of redshank. Yellow wagtail and whinchat breed within the moors, and in spring the pastures are an important feeding ground for whimbrel on migration. The rare marsh harrier and Cetti's warbler breed in the Avalon Marshes area; whilst the bittern, bearded tit, merlin, peregrine, hen harrier and short-eared owl are regularly present in winter. The Agency has helped to support a wetland bird survey in the Avalon Marshes area to study the impact of wetland restoration on important species. Herons are a common sight throughout the catchment, with several heronries, whilst kingfishers are locally common where conditions are suitable. Grey wagtail and dipper are associated with the more natural rivers of the catchment, such as the Alham. Bridgwater Bay is particularly important for moulting shelduck and wintering birds, whilst little egret are now commonly seen. Bearded tits breed at Berrow, and Cetti's warblers breed at the Royal Ordnance factory and various brick and borrow pits.

Several significant wetland and aquatic plant species and communities occur within the catchment. Plant communities in wetland sites contain rare species including marsh pea, milk parsley and bog myrtle, recorded at Catcott, Edington and Chilton Moors. Species rich mire-type meadows, principally at Shapwick Heath, contain notable species such as meadow thistle, carnation sedge, marsh pennywort and devils bit scabious. Tall fen vegetation on Westhay Heath supports three species with a restricted distribution: golden dock, marsh dock and milk parsley. Westhay Moor contains the last remnant of raised bog in the Levels and Moors. Here several species with a restricted distribution occur, including small bur-reed, small bladderwort and hare's tail cotton grass. Other notable species are bog asphodel, bog bean, round-leaved sundew and ivy-leaved bellflower.

The many miles of ditches and rhynes that pattern the Levels and Moors are exceptionally species rich, with nationally notable plants including the fan-leaved water crowfoot, spiked water milfoil, water violet and greater bladderwort. Floating species include frogbit, rootless duckweed and greater bladderwort with hair-like pondweed, water violet, whorled water milfoil and fen pondweed.

Several ponds in the catchment contain great crested newts, a species protected under the Wildlife and Countryside Act (1981).

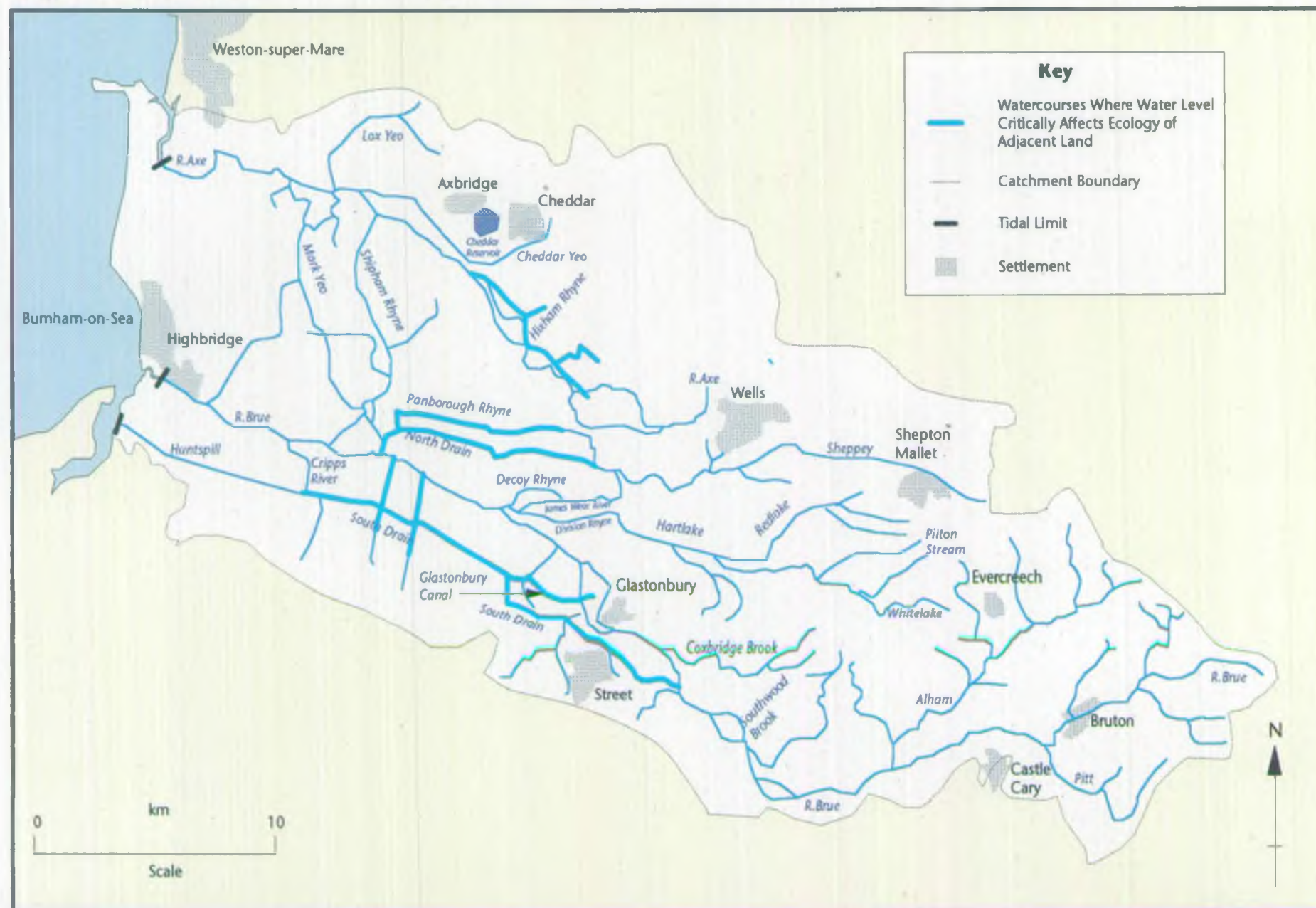
Native crayfish occur on the River Alham and we are planning to work with SERC on a survey of their status and distribution. They are uncommon in Somerset and have declined drastically throughout

England, mainly as a result of crayfish plague spread by other species introduced for commercial production.

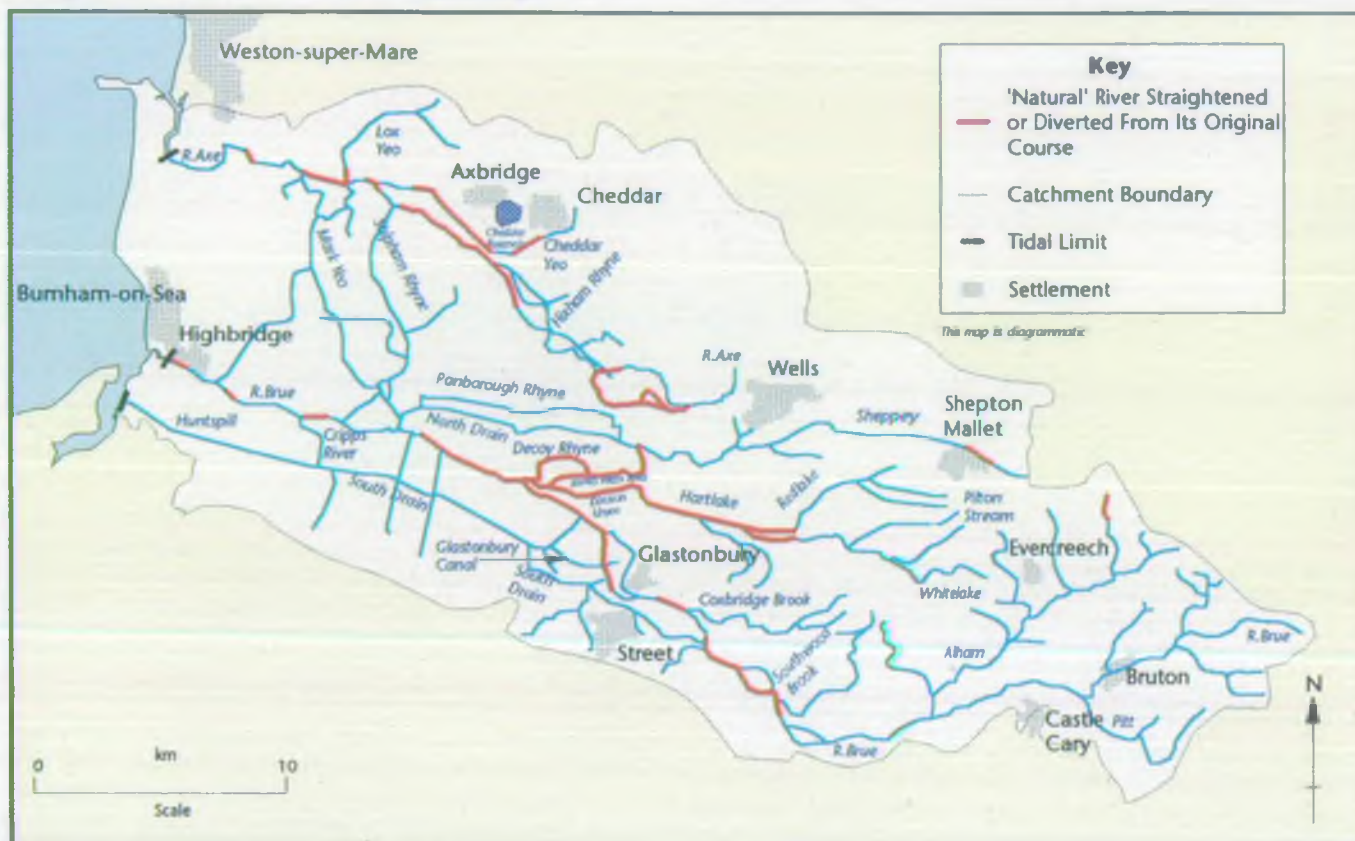
8.8 Invasive Plants

The following Invasive plant species are present in the catchment. Japanese knotweed is widespread in patches along rivers and rhynes and spreading and Himalayan balsam which is widespread in areas such as the upper Brue and may be increasing along the river margins, often at the expense of native flora. *Myriophyllum aquaticus* (formerly *braziliensis*), an escaped rampant aquarium plant is established in very large patches on Westhay Moor SSSI. Australian swamp stonecrop (*Crassula helmsii*) is a severe threat to small ponds and wetland river margins; has very rampant growth and is almost impossible to eradicate. Recently it has been found spreading out of a pond at Berrow Dunes LNR, in a rhyne near Mark and nearly filling a Great Crested Newt site south of Shepton Mallet. Those channels which are regularly dredged tend to have disturbed plant communities developing on the banks, including extensive stands of rape, for example along the banks of the South Drain. The Agency has a leaflet which gives advice to landowners on how to control these plants.

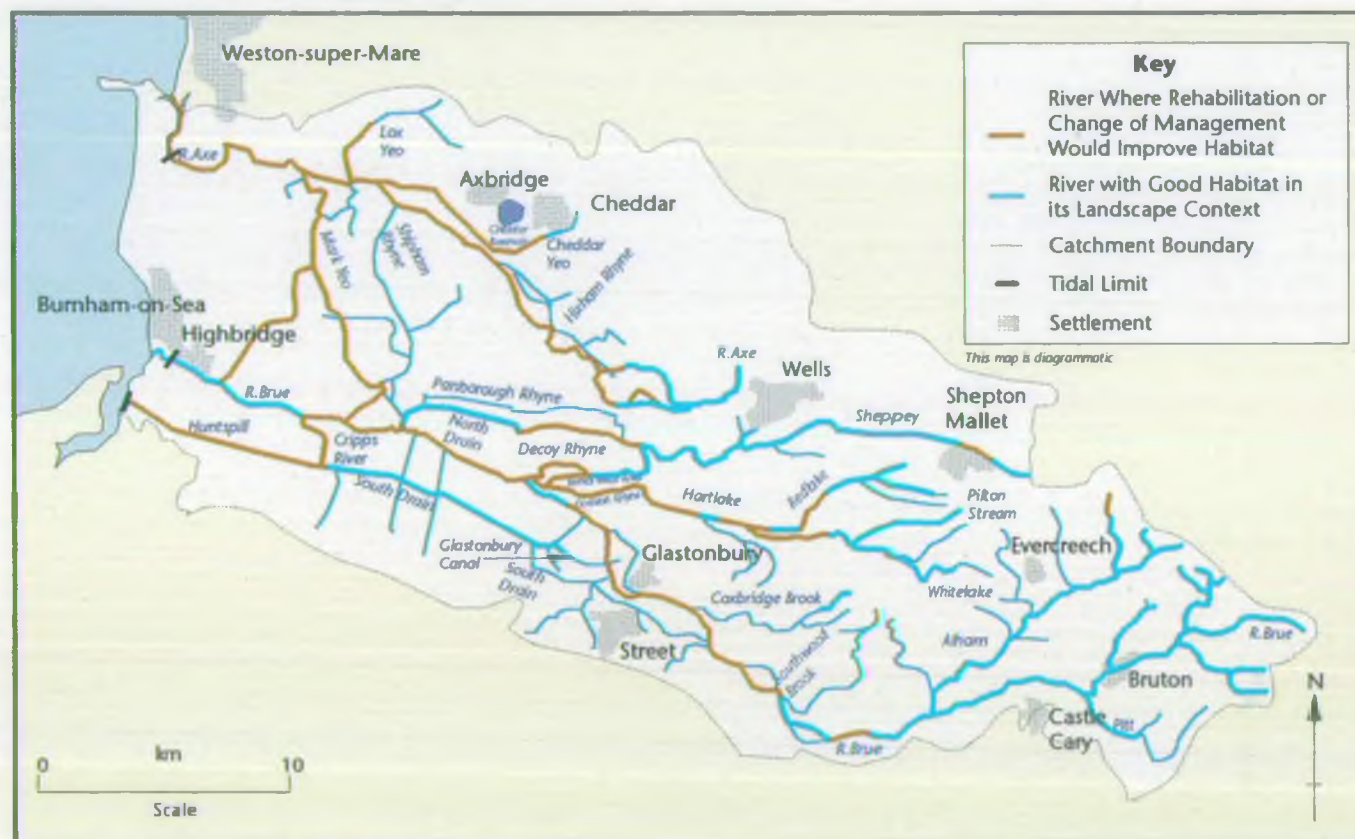
Map 14 Water Levels



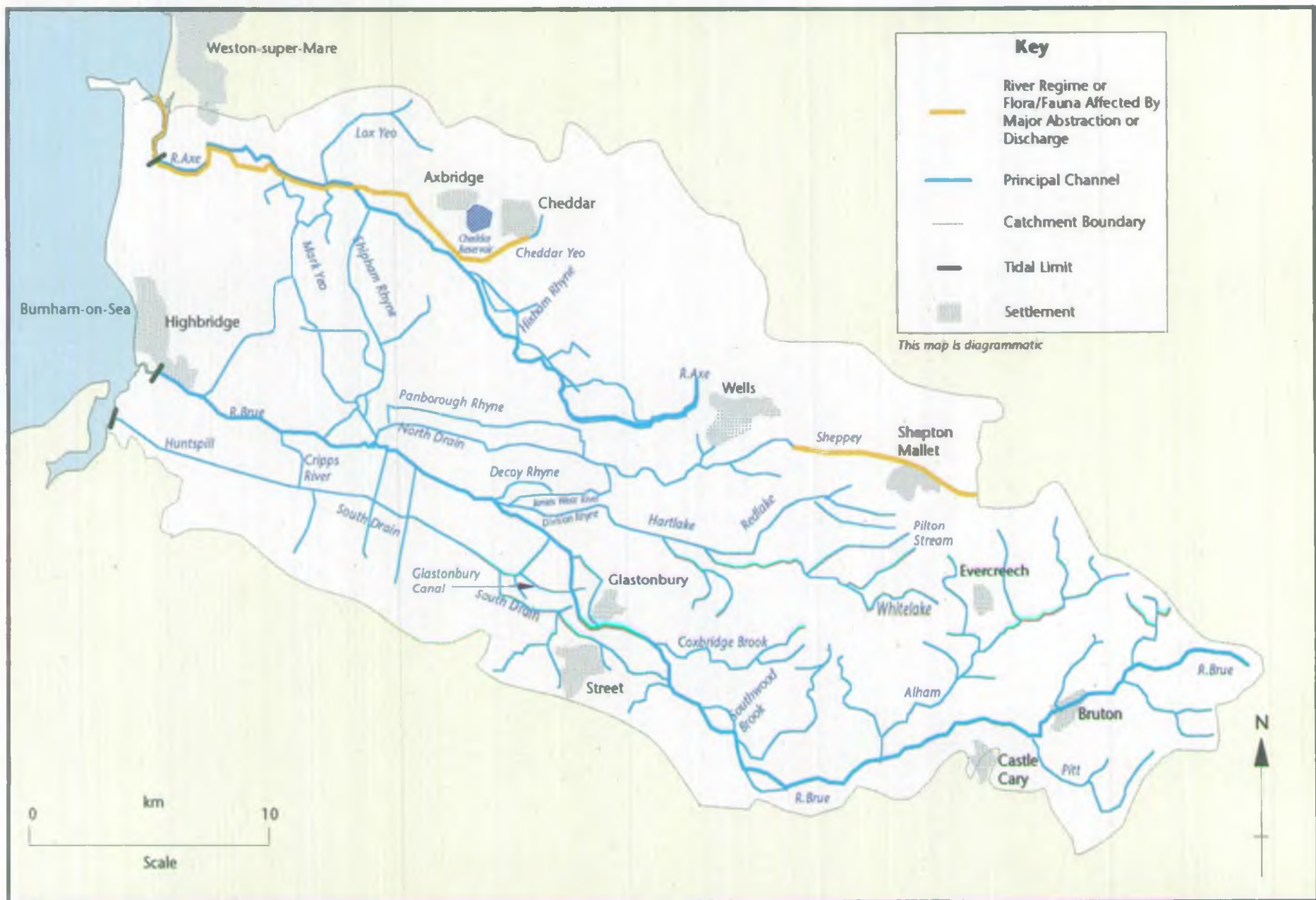
Map 15 River Habitat Quality 1



Map 16 River Habitat Quality 2



Map 17 River Habitat Quality 3



9. Archaeology

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

The southern slopes of the Mendips have yielded traces of early man. Palaeolithic hand axes and animal bones were found in the Hyena Den cave at Wookey Hole, while worked flint and chert tools from the late glacial period occur in combination with animal bones in several caves such as Gough's (New) Cave. Human burials and tools from the same period have also been found at Aveline's Hole.

Evidence of Mesolithic hunter-gatherer communities can be seen in the numerous flint tool scatters on the Mendips. Caves such as Rowberrow Cavern and Totty Pot at Cheddar were used as shelters, and also for burials as at Aveline's Hole. The remains of flint tools have been found on sand outcrops at Burtle and at the edge of the Polden ridge. This shows that these dry islands were being used to exploit the surrounding wetlands of the Brue valley.

Throughout the prehistoric period the low lying valleys were large wetlands. The peats and clays that gradually filled the valleys contain important archaeological information in the form of plant remains, insects, snails and pollen which can show us how the landscape of the wetlands and the surrounding uplands developed. Because the sea level was lower then, the prehistoric landscape also extends into the modern intertidal area where peat and 'submerged forests' can be seen.

Numerous wooden trackways were built across these wetlands during the prehistoric period to allow communication across the valleys and access to islands such as Burtle, Westhay and Meare. These are some of the oldest known trackways in the world; the earliest trackways are Neolithic in date, the most famous of which is the Sweet Track which runs south for 2 km from Meare. Associated finds include pottery, a yew bow, hafted arrowheads, a jadeite axe and several yew pins. Numerous other stone and flint axes have been found on the Mendips, which also contain a wide variety of Neolithic ritual monuments such as long barrows and the Priddy Circles.

Ritual monuments from the Bronze Age occur in the form of round barrows on the southern slopes of the Mendips, often in groups such as the Priddy Nine Barrows. There are also numerous Bronze Age wooden trackways across the central Brue valley and activity in this area is also evidenced by stray finds of metalwork and several hoards such as the rich find from Edington Burtle. However little is known of actual settlements, except for remains uncovered in the sand cliff at Brean Down where traces of salt production are also known.

Some wooden tracks dating to the early Iron Age have been found in the Brue valley but the finds of dug-out canoes at Shapwick and Godney also show that communication by water was becoming increasingly important. In the Iron Age, settlement is seen in the wetlands for the first time, in the form of the 'lake villages' of Meare and Glastonbury. The former was a seasonal trading centre while the latter was a permanent settlement, lasting for centuries, that yielded possibly the most significant array of artefacts ever found on a prehistoric site in Britain. In addition to these unique sites, other Iron Age settlement is known from Alstone, Shapwick, Shepton Mallet and several large hillforts such as Brean Down, Maesbury, and Brent Knoll. The caves of the Mendips, such as Soldier's Hole and Read's Cavern, were still being occupied and sometimes used for iron smelting.

In the Roman period settlement activity was quite different, with a major town on the Fosse Way at Shepton Mallet, and another town at Cheddar which may have served as a port for the rich silver and lead mines on the Mendips. The most important mining area was at Charterhouse where there are the remains of lead mines, two Roman forts and an amphitheatre. On the lowlands, extensive settlements and field systems are known in the Upper Axe valley and around Brent Knoll. Sea defences were probably created to protect these north Somerset lowlands, in contrast to the area south of Brent Knoll where salt production occurred in tidal marshes. A dense concentration of these saltern sites exists

around Highbridge, and at a later date in the area between Burtle and Gold Corner, now occupied by the Huntspill River.

In the Anglo-Saxon period a major burh and mint were located at Axbridge, and a West Saxon royal palace was created at Cheddar. Monastic centres were also established at Bruton and Glastonbury, with the latter being the largest monastic landowner in the whole country by the time of Doomsday. The evidence of the Doomsday Book also shows that smaller settlements were concentrated on the coastal clay belt and the upland areas.

In the Medieval period towns developed at Wells, Glastonbury, Axbridge, Shepton Mallet, Castle Cary, Bruton, Rackley and Lower Weare. The remains of well preserved rural settlements also exist in the form of numerous 'deserted medieval villages' and moated sites that occur on the coastal clay belt in the Mendips and at the eastern end of the Brue catchment. There was little settlement in the Axe and Brue valleys but these areas were very important for summer grazing, wood, peat for fuel, and fishing. In addition the rivers were major transportation routes with waterborne access from the sea possible as far inland as Glastonbury via the Axe valley and then the Brue, which used to flow north into the Axe at that time. The major landowners in the area, the Abbot of Glastonbury and the Bishop of Wells, started the process of reclaiming the moors by diverting rivers such as the Brue, creating a new drainage system, and making and repairing sea and river flood defences.

The remains of medieval and post-medieval flood defences can be seen in several areas such as at Lympham; and numerous small ports, fish weirs, mills, bridges, revetments and boats may still survive by the rivers and in the area of the former Meare Pool which was a very important medieval fishery. These remains, together with the prehistoric trackways and settlements on the lowlands, are all extremely vulnerable to destruction by desiccation of their waterlogged components, in addition to other physical threats.

10. Fisheries

10.1 Fish Populations

The distribution of the main types of fish found in the catchment is shown on Map 18. Trout populations on the River Brue above Lovington and its tributaries including the River Alham are mostly self supporting but there is a history of trout stocking in the Brue below Ansford. Minor species such as bullhead, stone loach and minnow are common but eels are infrequent especially on the River Alham. The coarse fishery on the Brue is dominated by chub and roach with good pike and eels downstream to Westhay. In the lowest reaches bream shoals increase and the majority of coarse fish species are present including the recently introduced sunbleak which is already numerous in the river at Huntspill and Highbridge. It remains to be seen if this species spreads as widely as bream and ruffe both introduced this century and both now well established.

On the River Sheppey upstream of Coxley and its principal tributary the Keward Brook, the brown trout population is self sustaining with spawning occurring in the Keward Brook though probably not in the Sheppey. Downstream of Coxley the river has good populations of chub, dace, roach, gudgeon, brown trout and eel. In the lowest reaches below Godney bream and ruffe are common. In the headwaters of the Division Rhyne system both the Redlake and the Pilton Stream have self sustaining populations of brown trout with the usual associated minor species. A few trout occur in the Whitelake near its confluence with the Pilton Stream. Much of the Whitelake, Redlake and Hartlake are too shallow to support many fish species and only eels and gudgeon are common with the former often abundant. In its lowest reaches the Division Rhyne has more depth and at times holds good numbers of roach and bream.

The large man-made watercourses of the Brue Valley, the Huntspill River, Cripps River, South Drain and North Drain, add considerably to the amount of slow and stillwater fisheries. Fish populations can travel between the various watercourses at certain times of year and may be excluded at others. Roach and bream are the principal species but most coarse fish do occur including some sizeable pike and carp.

Trout in the upper part of the River Axe are self supporting and occur with bullhead, stone loach and eel. At Theale, where the river gradient levels, roach, chub, pike, gudgeon and eels are the principal species. Below Clewer the channel deepens and all the local coarse fish species occur including large shoals of bream. Sunbleak, introduced elsewhere in Somerset and spreading, has apparently not yet reached the Axe.

The Cheddar Yeo, like the Axe, has a short salmonid reach but this suddenly ends where the river gradient levels outside Cheddar. Initially shallow and silty the coarse fish reach is dominated by eels but the full range of coarse fish notably chub and roach inhabit the lower reaches where depth increases the available cover.

The Hixham Rhyne is the only large man-made watercourse in the Axe valley but it is not a significant fishery with a limited population of coarse fish species and eels.

Fishery surveys on the River Brue and River Aharn were undertaken in 1990 and 1995, on the River Sheppey in 1991 and 1995, and on the River Axe and Yeo in 1991 and in 1996.

10.2 Angling

Regular angling takes place on the River Brue downstream of Bruton and on the River Sheppey downstream of Coxley. The River Axe is regularly fished downstream of Clewer. The major drains are all important angling waters. Many of the upper reaches and the smaller streams are sporadically fished for trout. In the lowlands many of the smaller watercourses are periodically angled for coarse fish (see Map 19). The larger rivers and drains are important venues for match fishing competitions. The Huntspill River and lower South Drain have hosted the National Angling Championship.

The coarse fishing rights in the catchment are mostly held by clubs with open membership. On the Huntspill River, Cripps River, North Drain and parts of the South Drain and River Brue fishing rights are owned by the Environment Agency and leased to clubs with open membership.

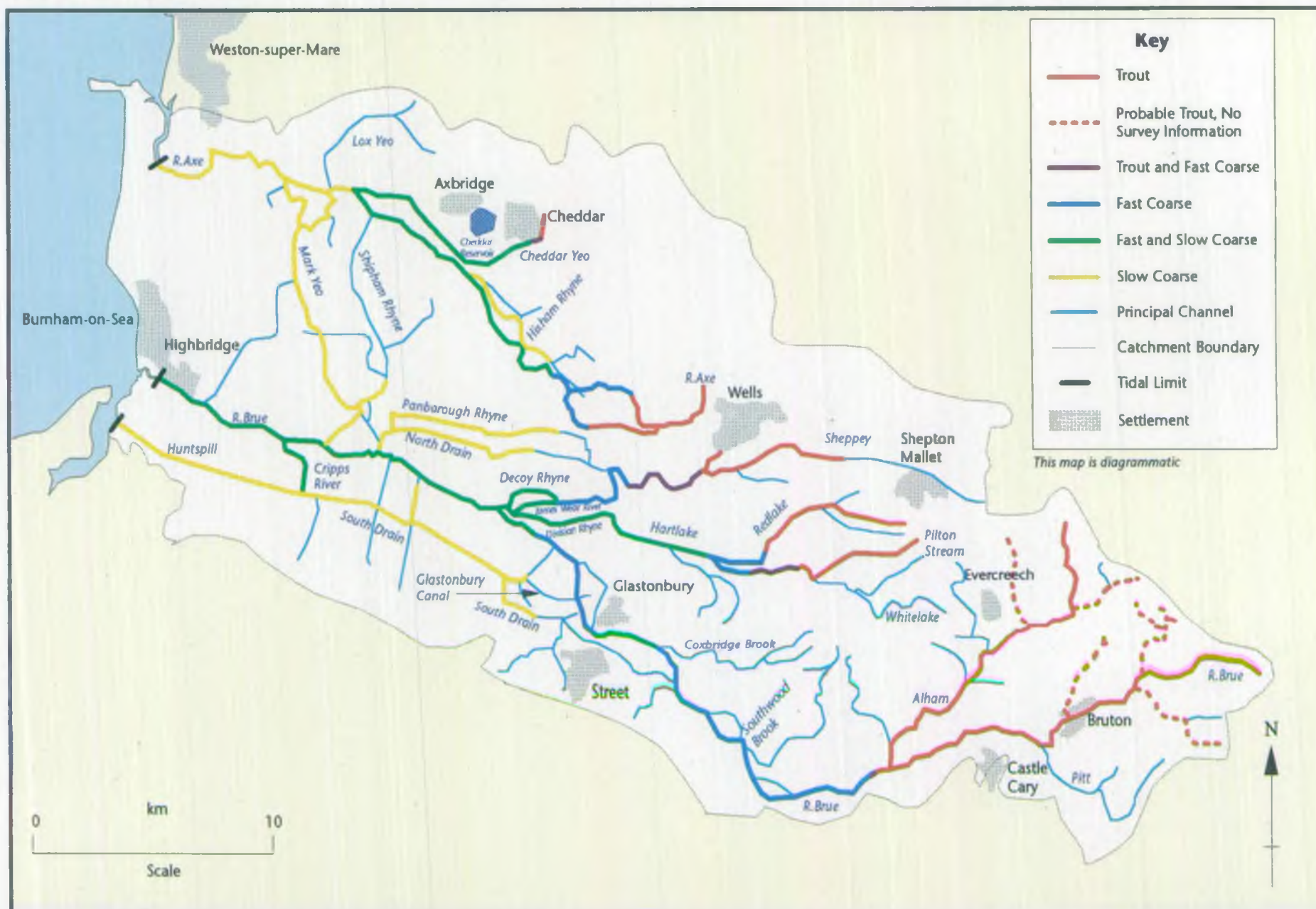
There are no stillwater trout fisheries in this catchment but there are numerous coarse fisheries which have become very popular angling venues over recent years. The largest is Cheddar Reservoir, a noted pike fishery. On the peat moors around Glastonbury there are a number of private and open fisheries in worked out peat diggings. Nearer the coast worked out clay pits have been fished for many years especially in the Highbridge area where the local angling club is the oldest such association in Somerset.

10.3 Commercial Fishing for Wild Fish Stocks

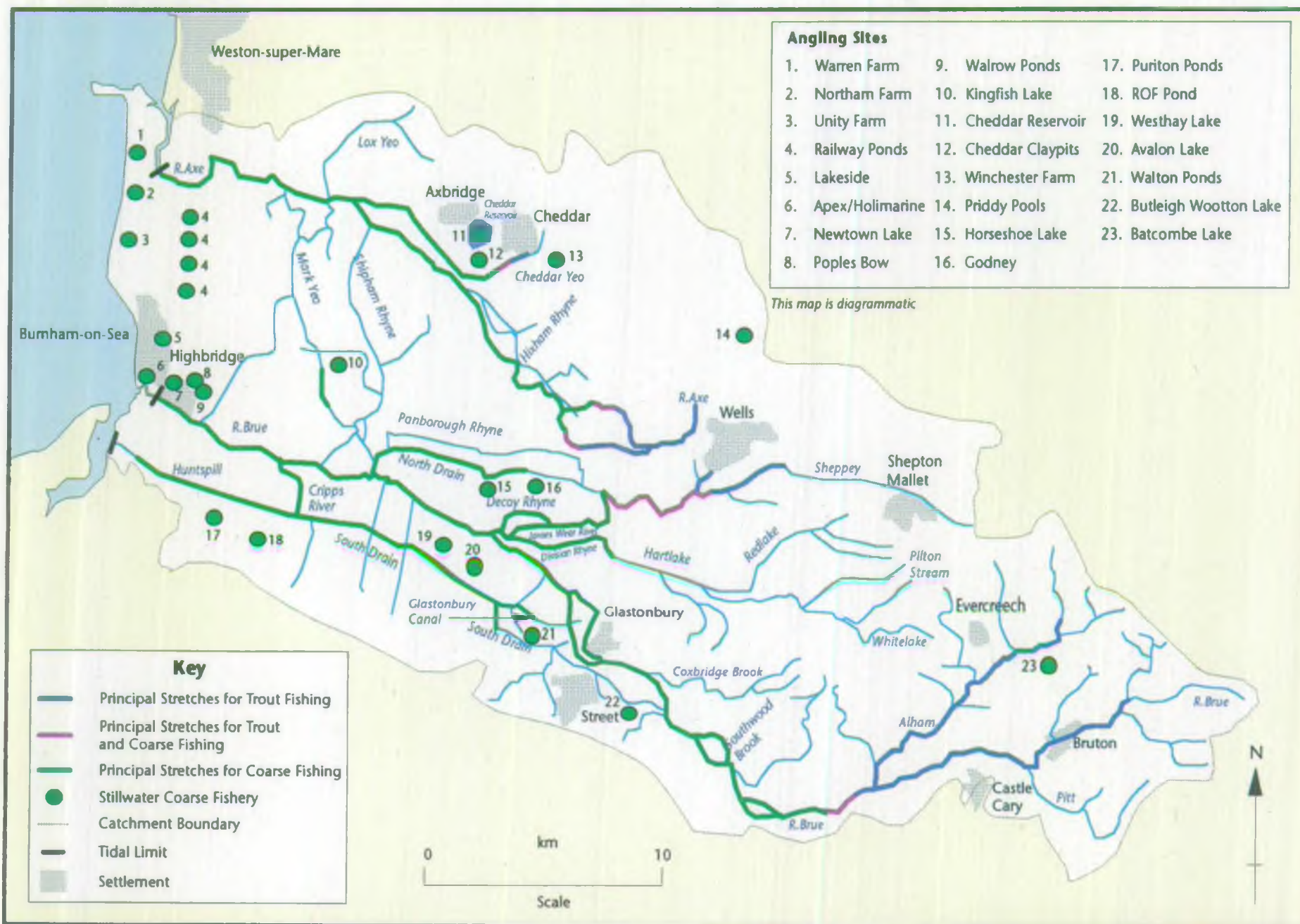
Occasional fyke netting for eels is the only commercial fishing practised in the freshwater part of the catchment. On the tidal reaches there is some commercial fishing for elvers but not to the extent which is found on the River Parrett. We will continue to monitor eel numbers and consider further regulation of commercial fishing if appropriate (see Issue 3.5).

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 18 Fisheries



Map 19 Angling



Information correct as of June 1997

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Brue and Axe Local Environment Agency Plan
Environment Agency

11. Recreation

Tourism and recreation are increasingly important activities within the catchment, especially in popular areas such as the Mendips and Ebbor/Cheddar gorges; around Glastonbury and Wells; and along the coastline. This section focuses on activities linked to rivers; for information on angling see Section 10.2.

Cycling is a popular activity within the catchment. The proposed Pedal the Levels cycleway is planned to run along the disused railway line from Glastonbury, partially on land owned by the Agency. The Avalon Marshes wetland restoration project, (see Section 8.6 and Issue 3.4), aims to improve quiet public enjoyment and understanding of the area. It is expected to provide opportunities for birdwatching, walking and environmental education. There are model boating venues at Apex Lake and on part of the Huntspill River.

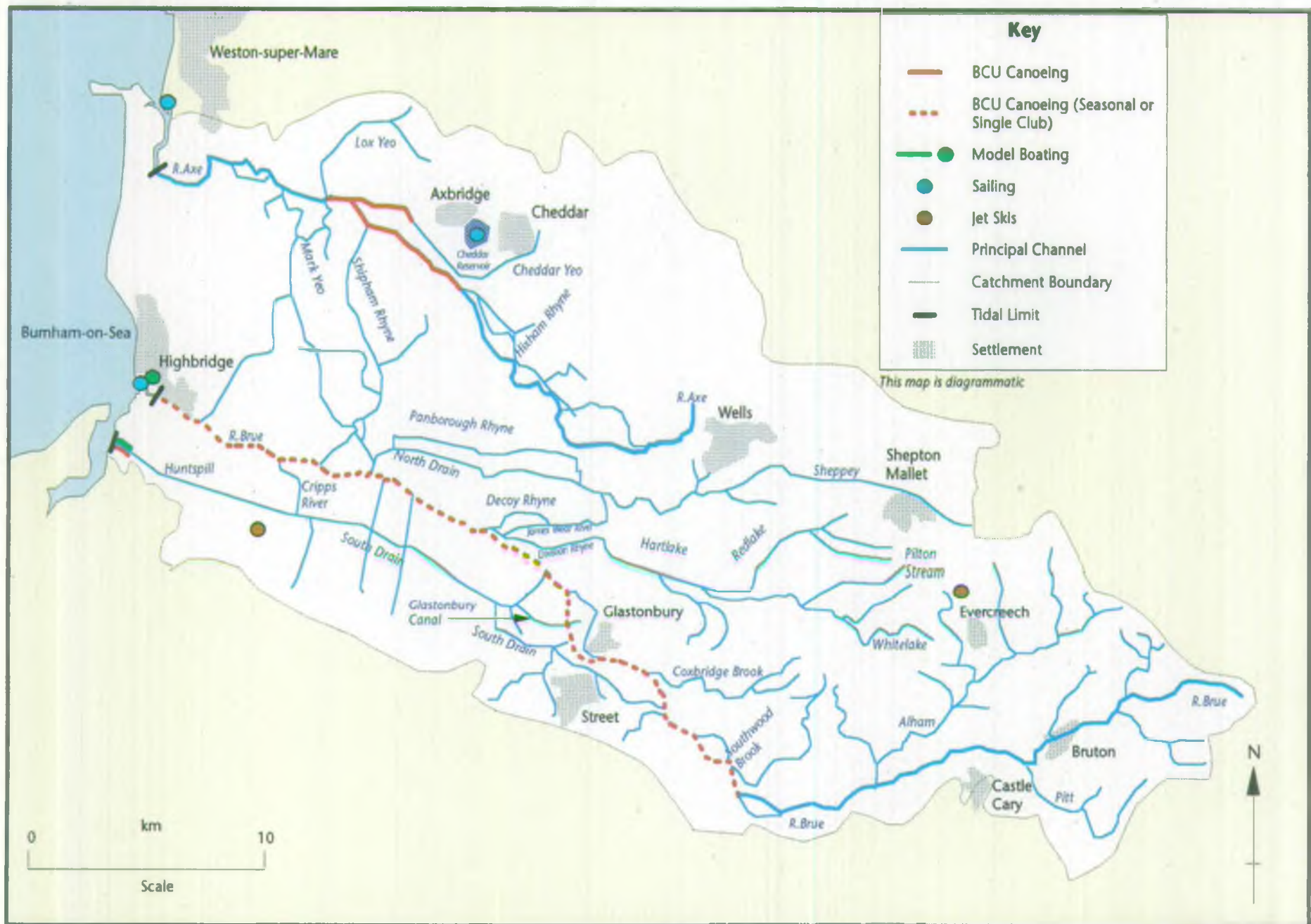
The most widely used areas for canoeing are on the middle reaches of the River Brue and the River Axe. The lower reaches of the Huntspill are also used for canoeing. (See Map 20) The Axe and Brue estuaries are used for yachting and boating. Two purpose made lakes have been created in the catchment to accommodate the demand for jet skiing.

Substantial lengths of public footpaths follow the line of the rivers within the catchment, for example along the banks of the Brue. There is great potential for improving access and the network of existing rights of way. (See Issue 3.4). Sedgemoor District Council is the Harbour Authority for the River Brue.

11.1 Agency Owned Sites

The Agency owns relatively large tracts of land within the Brue catchment, with the Huntspill and South Drain representing the largest areas, including the important trackway through Shapwick Heath which follows the Somerset and Dorset Railway Line. The Huntspill river in particular has great potential for recreation (see Issue 3.4). Increased tourism leads to greater pressure on the environment. Extra load to sewage treatment works in summer months result. Visitors can disturb wildlife and damage habitats unless carefully managed.

Map 20 Recreation



12. Mineral Extraction

The extraction of minerals from quarries, mines and pits for sand, gravel or clay can damage underground water resources and rivers and streams. Water is purified as it percolates through aquifers 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 diminished base-flows in summer.

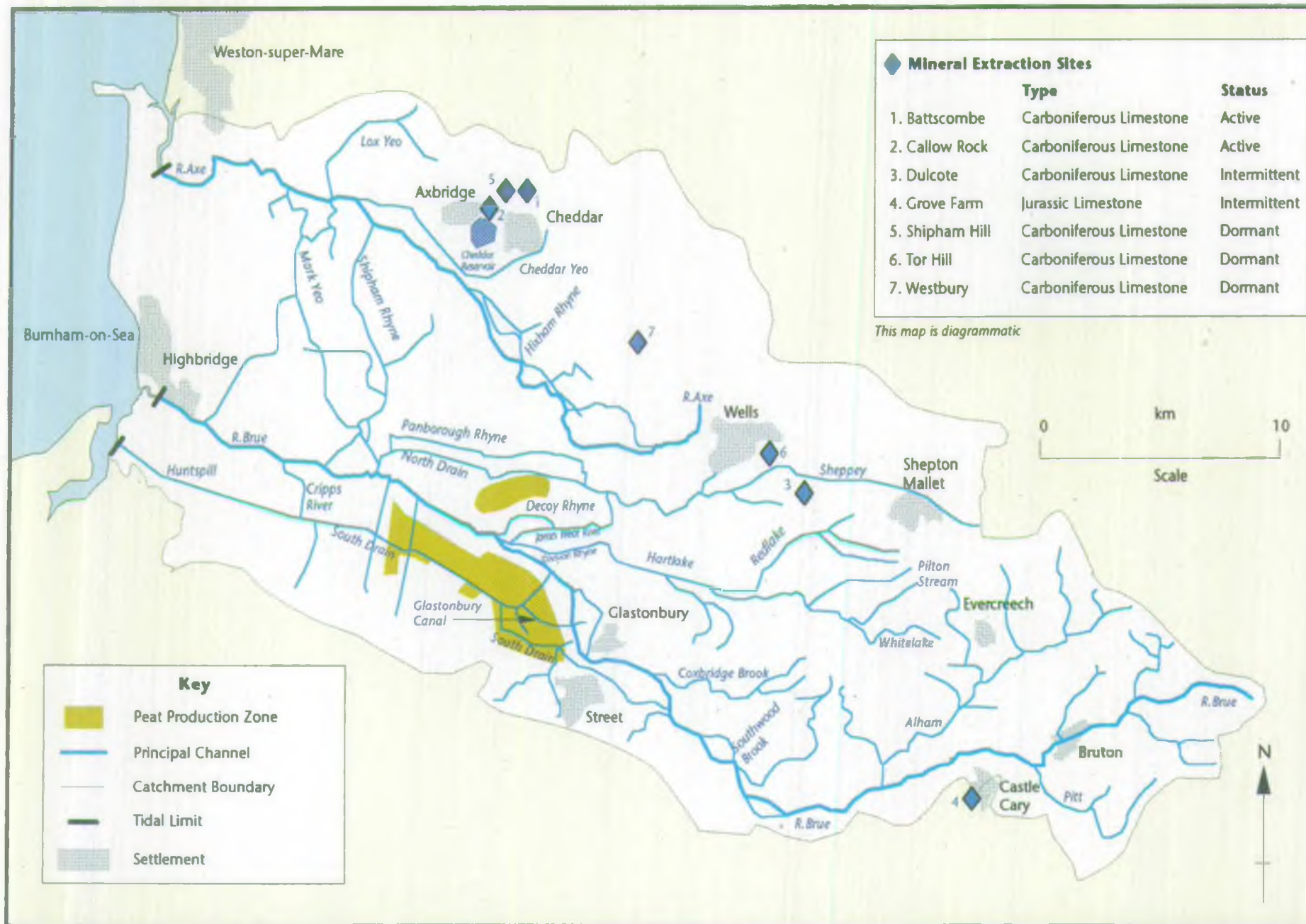
Disused quarries present problems of after-use. Often proposals are made for land-filling with controlled waste (see Section 13) with further potential for pollution.

Within the Brue Catchment Carboniferous Limestone and peat are extracted. Active limestone quarries are at Battscombe and Callow Rock. Carboniferous Limestone is also quarried intermittently at Dulcote and Jurassic Limestone is quarried intermittently at Grove Farm. There are three dormant Carboniferous Limestone sites at Shipham Hill, Tor Hill and Westbury, where planning permission to quarry exists but activity has ceased (see Map 21). Limestone quarries can have significant impact on the environment. The River Alham is at risk from Torr Quarry in the neighbouring Frome catchment area and from which the river is augmented at low flows by a pumped discharge to ensure that summer flows are maintained to a natural standard.

There are two Peat Production Zones in the Brue and Axe Catchment (see Map 21). Thirty-one separate peat areas make up the Zones. The County Structure Plan defines the peat production zones as Special Landscape Areas. Some isolated peat extraction sites lie within the Environmentally Sensitive Area. Peat is being extracted from large areas of Shapwick, Meare, Ashcott, Westhay, Walton, Glastonbury and Street Heaths, within the southern zone. The workings and ancillary buildings dominate the landscape.

Peat extraction can have marked environmental effects resulting in a loss of trees and hedgerows, altered field and drainage patterns and lowered ground level. In addition, de-watering discharges from peat extraction can have a significant impact on the quality of receiving waters (see Issue 3.8). Peat extraction areas can however be restored as valuable wildlife and amenity areas (see Section 8.6) and the Agency is involved in regulating and determining the suitability of afteruse proposals through consenting works on or adjacent to main river and/or advising on planning matters.

Map 21 Mineral Extraction



13. 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, waste water, explosives and radioactive wastes (but see Section 22), however, 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.

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 household recycling targets are to be met, and the Landfill Tax which was introduced on 1st October 1996. The Producer Responsibility Obligations (Packaging Waste) Regulations were introduced in January 1997 placing responsibility on businesses that handle packaging to recover and recycle certain proportions of packaging materials.

The Landfill Tax is enforced by HM Customs and Excise. There are two levels of tax, £2 per tonne for inactive (inert) wastes and £7 per tonne for all other wastes disposed of at landfill sites. Landfill Tax is levied on the landfill site operators and before VAT is calculated. Site operators can contribute to enrolled Environmental Bodies for specific projects. In return they can claim a tax credit worth 90% of any contribution to a maximum credit of 20% of their landfill tax liability.

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
- by the end of 1998, to set a target for overall waste reduction
- recycling or composting 25% of household waste by 2000
- having easily accessible recycling facilities for 80% of householders by year 2000
- encouraging 40% of domestic properties with a garden to carry out home composting by year 2000.

Nationally Waste Surveys will be carried out by the Agency providing accurate, consistent data on waste arisings. The Agency will encourage and support waste minimization initiatives and recycling facilities.

A number of waste management activities are exempt by statute from the requirements for licensing. There are currently 45 exempted activities 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 harm to human health, and all 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 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.

13.1 Waste Arisings

Because the boundary of this plan does not match the boundary of local authority areas it is difficult to accurately quantify the amount of wastes arising within the catchment area. However, the waste arisings by District Council area have been evaluated for 1994/5. The Brue catchment takes up roughly half of the area covered by the Districts of Sedgemoor and Mendip. The arisings in these Districts are as follows:

Table 8 Waste Arisings

WASTE TYPE	WASTES ARISING (TONNES PER YEAR) 1994/5		
	SEDGEMOOR D.C.	MENDIP D.C.	COMBINED TOTAL
Household	45,000	41,000	86,000
Commercial	66,000	77,000	143,000
Industrial	432,000	487,000	919,000
TOTAL	544,000	604,000	1,148,000

13.1.1 Household waste

The combined total household waste figure comprises of waste collected from households by the Waste Collection Authorities and those wastes taken by householders to the local Household Waste Recycling Centres (HWRCs). The household waste from these two districts goes to either Walpole or Dimmer landfill sites near Bridgwater and Castle Cary respectively.

Approximately 6,500 t/yr of household materials are recycled in the two District areas and this comprises - 1,445 t/yr of glass; 1,850 t/yr of metal; 2,780 t/yr of paper; 40 t/yr of waste mineral oil; 255 t/yr of textiles and 130 t/yr of green waste.

13.1.2 Private sector

Within the two District areas 919,000 tonnes of industrial waste and 143,000 tonnes of commercial waste was produced during 1994/5. Again, the Dimmer landfill site at Castle Cary and Walpole landfill site near Bridgwater (see River Parrett LEAP) are able to accept these wastes.

2,160 tonnes of special waste was produced within the Sedgemoor and Mendip District areas during 1994/5 with the majority of this waste being exported for treatment and disposal outside Somerset.

Many companies are looking to minimize the amount of wastes they produce. An example of such an initiative is Clarks International - the footwear manufacturer and retailer based at Street. The company first used waste minimization techniques through a project to reduce VOC (Volatile Organic Compound) emissions. These techniques helped to reduce the emissions by over 50% in 2 years, and led to annual savings of over £150,000 per year. Clarks are now examining all their waste streams, and adopting waste minimization techniques where feasible. Projects vary from simple measures such as the improved decanting of chemicals, through to fundamental changes in the way some products are

produced. This work, although in its infancy, is already reducing the volumes of waste produced and achieving substantial cost savings.

13.2 Waste Management Sites

There are 27 operational licensed waste management facilities within the catchment, and 32 closed licensed facilities - see Map 22. However, none of the major active landfills which accept household, commercial and industrial wastes are located within the catchment.

All but 2 of the 10 landfill sites within the catchment accept soils and clean construction/demolition wastes. The exceptions are The Beckery Landfill near Glastonbury which is licensed to Wessex Water PLC and accepts pressed sewage sludge and Inveresk Ltd's landfill site at St Cuthberts Paper Mill near Wells, which is licensed to accept its own paper mill effluent sludge.

Approximately 30,000 tonnes of waste materials were deposited at the landfills within the catchment during 1995/6 and some 25,000 tonnes of this was soils and clean construction/demolition wastes. The remainder originated from industry.

Two closed landfill sites (Dulcote and Windsor Hill) were licensed to accept household wastes, with leachate management on 'dilute and disperse' principles. Seven other closed landfill sites in the catchment have accepted commercial and industrial wastes the remainder were licensed for soils or clean construction/demolition wastes.

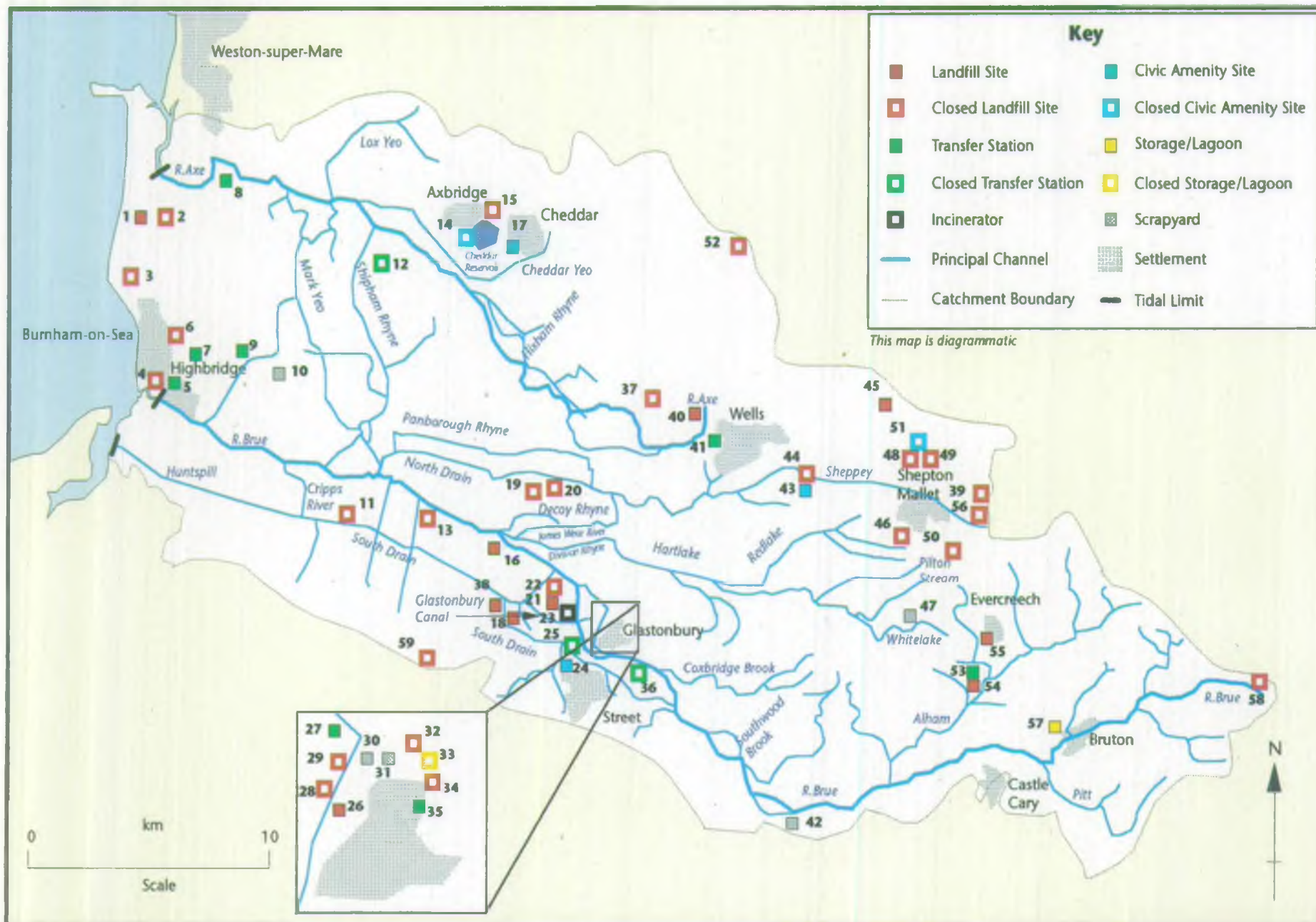
There are 8 operational transfer stations, 5 scrapyards and 3 HWRCs in the catchment and these currently handle a wide range of wastes. There is also a licensed sludge storage lagoon for the temporary holding of organic liquid wastes prior to disposal onto land at Creech Hill Farm, Evercreech.

Agricultural land in the catchment is extensively used for the spreading of various industrial waste liquids and sludges (such as blood, septic tank and milk wastes) and sewage sludge from Wessex Water PLC sewage treatment works. Approximately 134,000 tonnes of such materials were spread to land in the 2 Districts during 1994/5. All sites which involve the spreading of agricultural waste to land in Somerset which the Agency is aware of have all been assessed on the basis of properly qualified advice.

13.3 Waste Planning

Strategic aspects of waste disposal in the catchment will be defined in plans produced by Somerset County Council. The *Draft Waste Local Plan*, which deals with geographical, population and planning issues in Somerset, is due to be published by Autumn 1997. The County Council's Waste Disposal Authority together with the 5 District Councils in Somerset have produced a *Waste Management Strategy for Somerset* which deals with the future management of household waste. This was issued for public consultation early in 1996. The *Waste Survey Report* which deals with such matters as types and quantities of waste arisings and available capacity for wastes in Somerset was published in April 1996 and is available from Somerset County Council.

Map 22 Waste Disposal



Information correct as of June 1997

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Brue and Axe Local Environment Agency Plan
Environment Agency

Table 9 Waste Management Sites

Open Landfill Sites		
1	I	Westward Rise Holiday Park, South Road, Brean
16	I	Ashcott Road, Meare
18	I	East Allotment Drove, Walton Heath, Sharpam
21	I	Glastonbury Heath, Sharpam
26	T	The Beckery, Glastonbury
38	I	Ashcott Road, Ashcott
40	T/L	St Cuthberts Paper Mill, Wookey
45	T	Maesbury Quarry, Maesbury, Wells
54	I	Former Clay Works, Evercreech, Shepton Mallet
55	I	Leighton Lane, Evercreech

Open Civic Amenity Sites		
17	H	Wedmore Road, Cheddar
24	H	Farm Road, Street
43	H	Dulcote Quarry, Wells

Closed Civic Amenity Centre		
51	H	Windsor Hill, Shepton Mallet

Closed Civic Amenity Sites/Landfill		
14	H/T/I	Portmead Drove, Axbridge

Open Transfer Sites		
5	I/T/H	The Old Oil Works, Springfield Road, Highbridge
7	I/T	Edithmead MS Depot, Edithmead
8	T	Boat Lane, Lympham, Burnham-on-Sea
9	T/I	Harp Road, Edithmead
27	S/T/I	Middle Drove, Glastonbury
35	S/T/I	Glastonbury Depot
41	T/I	Haybridge, Wells
53	I/T	Beverley House, Southwood

Closed Transfer Sites		
12	L/W	Unit 12, Badgworth Barns, Lower Weare
25	T	Farm Lane, Street
36	T/I	Watchwell Drove, Street

Key	
W	Special waste
D	Difficult waste
L	Liquids/Effluents/Sludges
H	Household (Putrescible)
C	Clinical wastes
T	Commercial/Industrial (Trade)
S	Semi-inert
I	Inert

Closed Landfill Sites		
2	I	Brean Leisure Park, Golf Course, Brean
3	I	Unity Farm, Coast Road, Berrow
4	I	Old River Brue, Burnham-on-Sea
6	I	Edithmead Railway Bridge, Burnham-on-Sea
11	I	Old South Drain, Edington Bridge, Burtle
13	I/T	Adj. Westhay/Burtle Road, Meare
15	I	The Parsonage, Cheddar Road, Axbridge
19	I	Eastern Drove, Meare, Glastonbury
20	T	Seithe, Lewis Drove, Godney, Wells
22	I	Wilderness Drove, Sharpam
28	T	Adj. Baileys Factory, Glastonbury
29	I	Higher New Close, Porchestal Drove, Glastonbury
32	T	Paradise, Glastonbury
34	I	Dyehouse Lane, Glastonbury
37	I	Dis. Railway Cutting, Easton, Wells
39	I/T	Green/Chelynch Quarries, Chelynch, Doulting
44	H/T/C/D	Dulcote Tip, Dulcote, Wells
46	I	Three Arch Bridge, Pilton, Shepton Mallet
48	I	Downside Quarry, Windsor Hill, Shepton Mallet
49	H/T/C/D	Windsor Hill Tip, Shepton Mallet
50	T	Whitstone Hill Farm, Cannards Grave, Wells
52	I	Castle Farm, East Harptree
56	I	Queen Quarries Plantation, Doulting
58	T	Druley Hill, Brewham, Nr Wincanton
59	I	Lippitts Way, Shapwick

Open Scrapyard		
10	T	Mark Moor Motors, Northwick Road, Highbridge
30	T	Old Station Yard, Glastonbury
31	T	Park Farm Trading Estate, Benedict Street, Glastonbury
42	T	Old Railway Station, Lydford on Fosse, Nr Somerton
47	T	Myrtle Garage, Pylle, Shepton Mallet

Closed Incinerator		
23	T	Cradlebridge, Glastonbury

Open Storage/Lagoon		
57	L	Creech Hill Farm, Evercreech

Closed Storage		
33	I	Glastonbury Western Relief Road, Glastonbury

14. 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 1997 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.

15. Flood Defence and Land Drainage

The Brue Catchment particularly in the lower reaches has been highly modified to control river and tidal flooding and provide field irrigation. Under the Land Drainage Act the more significant rivers are designated as *main river* and the Act gives the Agency powers and responsibilities for maintaining them. The Agency manages the *main river* within this network and is responsible for a large number of water level management control structures. An inventory of these structures and their maintenance requirements is provided in Section 15.2.1. The four Internal Drainage Boards, Lower Axe, Upper Axe, Lower Brue and Upper Brue, maintain the other parts of the drainage and irrigation network in the middle and lower reaches. (See Map 23). Riparian owners must maintain non-main river, with local authorities responsible for flooding matters.

15.1 Flood Risk and Development

In accordance with *DoE 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.

The drainage of the Brue Catchment has been computer modelled and this will allow the determination of the effects of urban development and to develop appropriate drainage policies for surface water disposal.

Future development proposals within North Somerset, Mendip, Sedgemoor, and South Somerset Local Plans are concentrated primarily within and around the existing settlements within the Brue Catchment (see Section 16).

Levels of flood protection, tidal for the lower catchment, and fluvial for the upper catchment are relatively high, however, increased development will require flood mitigation works to overcome risk to third parties from increased surface water disposal. See Issue 3.14.

15.1.1 Flood surveys

The DoE requires the Agency to carry out flood surveys which identify indicative flooding envelopes. 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 in June 1997. These flood maps will be made available to all local planning authorities by the end of September 1997. 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.

15.2 Maintaining River and Flood Defence Structures

We maintain rivers and flood defence structures to reduce the risk of flooding. (See Map 24 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 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 3.2

15.2.1 Pumping plant.

This section reviews the condition of the individual pumping stations in the Brue and Axe Catchment, (see Map 24). Pumping stations have a working life of between 20 and 50 years. Provided the need remains they then have to be refurbished or replaced. Each case is looked at separately but we do not currently have sufficient budget available to meet likely needs.

Table 10 General condition of pumping stations as at January 1997

Pumping Station	Comments
Clewer	Major problems with control equipment, requires immediate replacement. Health and Safety (H&S) concerns. Pump motors and pumps require refurbishment within 10 yrs. Capital-refurbishment is planned for 1998.
Southhill	Requires replacement of pump units and controls within 3 yrs or upon major pump failure.
Whitehouse	New pump installed 1993 operating satisfactorily. Electrical controls do not permit automatic operation. H&S concerns. Automatic operation relies upon original British pleuger pump. Capital refurbishment is planned for 1998.
Withy Drove	Two submersible electrically powered pumps deliver 0.132 m ³ /s for summer irrigation. Site refurbished 1991 - new pumps and controls. Pumps will require refurbishment within 15 yrs.
Blackford	One electrically driven Archimedian screw pump installed in 1973, delivering 0.26 m ³ /s. Equipment is generally in good condition. Refurbishment required within 10 yrs.
Gold Corner	Four 1942 pumps delivering 17.5 m ³ /s. Three 1942 diesel engines, one 1994 electric motor and variable speed drive. Two of the three diesel engines have been overhauled over past 4 yrs. A major failure of No.2 Diesel engine in 1996 is still being investigated.
Sloway Lane	Two submersible electrically powered pumps delivering 0.132 m ³ /s for summer irrigation. Refurbished 1991 - new pumps and controls. Refurbishment required within 15 yrs.
North Drain	Three diesel engine driven pumps installed in 1959 delivering a total of 5.52 m ³ /s. One pump also has electric motor and automatic control panel. Diesel engines require immediate refurbishment. Electric drive and controls require refurbishment within 5 yrs.
Crossmoor	One electrically powered Archimedian screw pump installed in 1980, delivering 0.72 m ³ /s. No significant problems on this site. Refurbishment of screw and controls required within 10 yrs.

The Rivers Axe and Brue drain relatively small upland catchments and then cross the low lying, often peaty Moors and the slightly higher clay Levels before reaching the sea. Where the rivers cross the Moors they are "high level carriers" conveying water from their upland catchments at levels which are above the adjacent land. Most of the drainage from the Moors passes to artificial Drains often running in parallel to the river but at a lower level. The water from the Drains is then lifted up to river level by pumping stations. In the Axe valley Clewer PS lifts water into the Axe whilst Cross Moor PS lifts water into the Cheddar Yeo. In the Brue valley the North Drain PS lifts water from the Moors north of the Brue into the river. South of the Brue the South Drain water is lifted by Gold Corner PS into the Huntspill River which flows directly to the sea. There is some gravitational drainage into the natural rivers especially in their lower reaches where they cross the coastal Levels as the ground is typically two metres higher than the more inland Moors.

In the summer months the Moors and Levels are irrigated from the river systems. The lower river reaches are held at a high level (summer penning) by large sluices; Bleadon on the River Axe and Hackness on the River Brue. Water is then run off "sideways" into the rhyne system. In its lower reaches the River Brue has insufficient resources to irrigate the land to its north and all this area of coastal Level is supplied with water from the Axe. Water is pumped from the Axe at White House PS and South Hill PS and then works its way across the Levels towards the Brue by gravity. South of the River Brue the Huntspill river cut across various old lines of drainage and irrigation. However Brue water can be

stored in the Huntspill which thus acts as a reservoir in the summer. Two pumping stations Sloway PS and Withy Drove PS on the Huntspill banks keep the local rhyme systems topped up.

The Moors and Levels are generally below the high tide level of the Bristol Channel and tidal sluices, Brean Cross Sluice on the Axe and Highbridge Clyce on the Brue, are necessary to exclude the sea. Without these sluices river banks would need to be maintained above sea level and salt water would contaminate the cattle watering, freshwater fisheries and other interests.

15.2.2 Bruton Dam

Bruton Dam is a flood detention dam registered under the Reservoirs Act 1975 and provides a major element of the flood alleviation scheme for the town of Bruton.

The dam was constructed between 1983 and 1984 and was designed to provide a 1:100 year standard of defence to Bruton, and to resist failure from the legally required 'Probable Maximum Flood'. Its construction was initiated by major flooding to Bruton in 1979 and 1982.

Concern has been expressed that the information used in the dam's design is inaccurate and that the scheme does not meet its intended design standard. In 1996 the National Rivers Authority commissioned an independent review of flood alleviation schemes incorporating detention reservoirs. No major shortcomings in the design of the dam were encountered but minor improvements and actions will be implemented as suggested in the review report.

15.3 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 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.

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

Table 11 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

We have identified the following flood problem locations in the Brue and Axe Catchment:

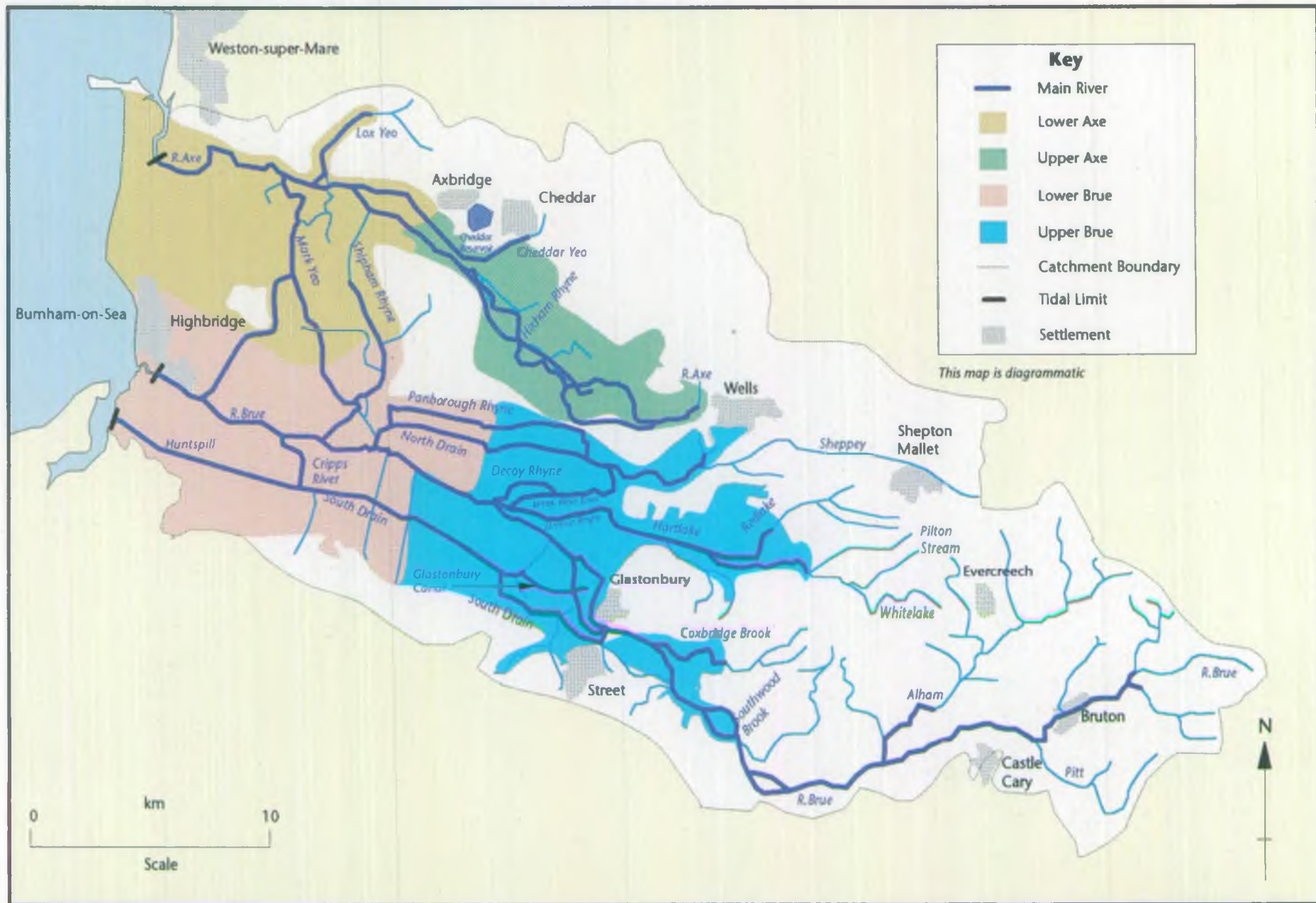
- Bruton below the detention reservoir ; and
- the whole of the lower reaches of the Brue.

15.4 Shoreline Management Plans

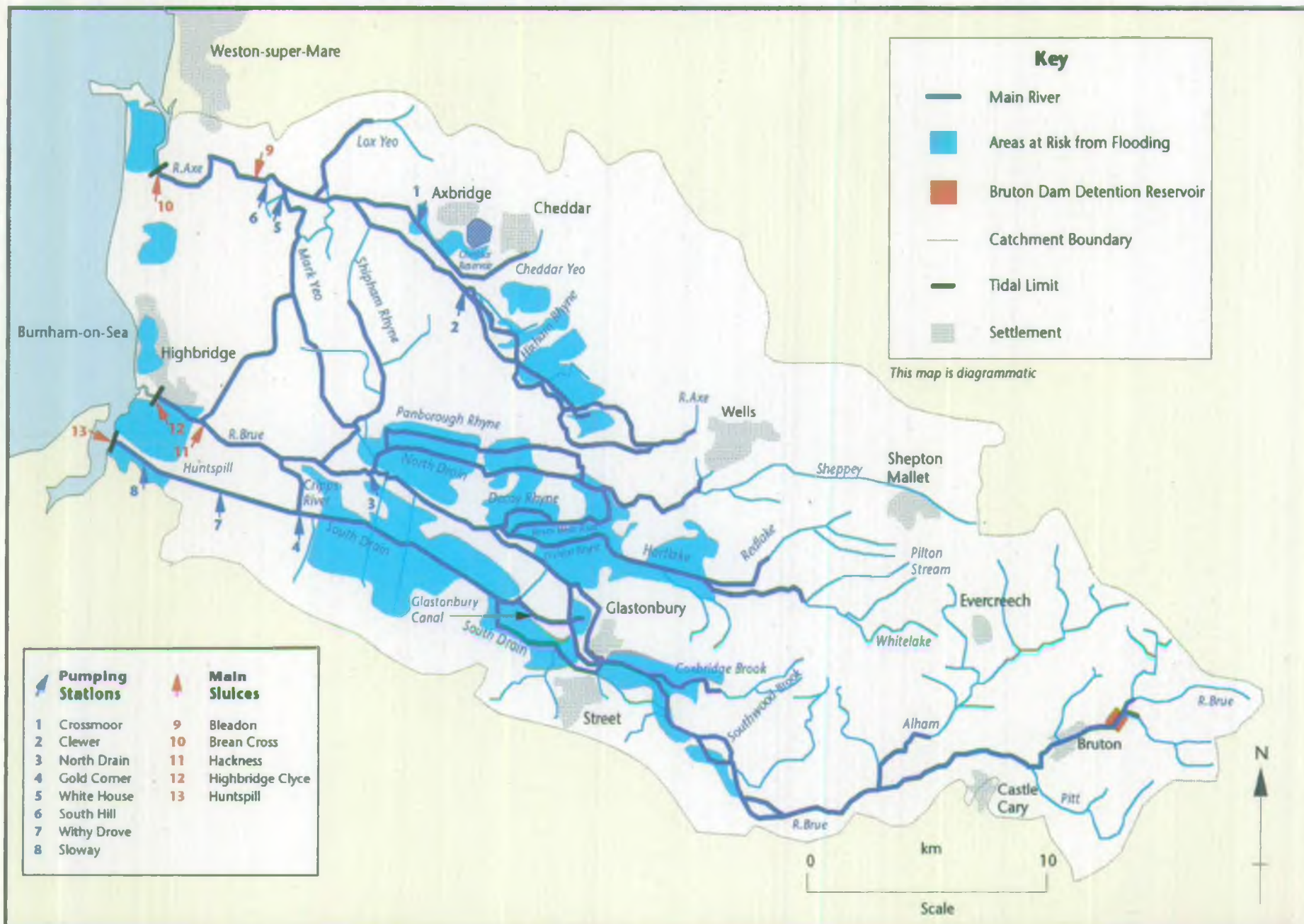
The aim of a Shoreline Management Plan (SMP) is to provide the basis for sustainable coastal defence policies within a sediment cell and to set objectives for the future management of the shoreline. These plans are being drafted by coastal cell groups of which the Agency is a member.

Two SMPs cover the coast for these two catchments, their boundary being at Brean Down. North of this location is the Severn Estuary SMP whilst south of this point the Bridgwater and Bideford Bays SMP is being developed. It is planned that during 1998, both plans will have been adopted. (See Severn Estuary Strategy Joint Issues Report).

Map 23 Main River and Internal Drainage Boards



Map 24 Flood Defence Floodable Areas and Water Control



16. Development and the Environment

The catchment primarily falls within the Local Authority administration areas of Mendip District Council and Sedgemoor District Council. The head of the catchment lies in the South Somerset District Council whilst a small part of the lower reaches of the Axe are within the North Somerset Unitary Authority boundary (see Map 25).

The majority of the catchment is within the area of the approved Somerset Structure Plan - Alteration No. 2 adopted in 1992. The Plan sets provision for housing, shopping and employment growth to 2001. The Plan is currently under review and the period of the review is up until 2011. The Plan recognised that Somerset should be catering for approximately 2,500 new dwellings each year between 1991 - 2011 generally in and around urban areas. Development is guided towards existing sizeable settlements such as Burnham-on-Sea/Highbridge, Glastonbury, Shepton Mallet, Street and Wells.

A draft consultation review of the Structure Plan in 1995 emphasised the social and economic needs of rural areas and the protection and enhancement of AONBs, SLAs, Special Landscape Features and the peat soil of the levels and moors. Draft policies consider safeguarding water resources, protection of floodplain, development in areas liable to flood, waste disposal, water-based recreation, the conservation and improvement of the coastal environment and protection of the environment. The Plan also identifies major road improvements (see Map 25). The Structure Plan review was placed on deposit in February 1997. The Structure Plan Review proposes policies to protect designated conservation areas.

The Local Plans produced by the District Councils contain the detailed planning policies and identify specific areas considered suitable for development. They also identify such things, for example, as conservation areas, floodplains, flood risk areas and areas of archaeological importance. The local plans covering the Brue and Axe Catchment are given in Table 12. Map 25 shows the location of committed development. Local Plans will be replaced by District Wide local Plans to cater for development needs up to 2011.

Somerset County Council produces a Minerals Plan detailing present and future demands for minerals in the area. The local authorities also produce waste local plans.

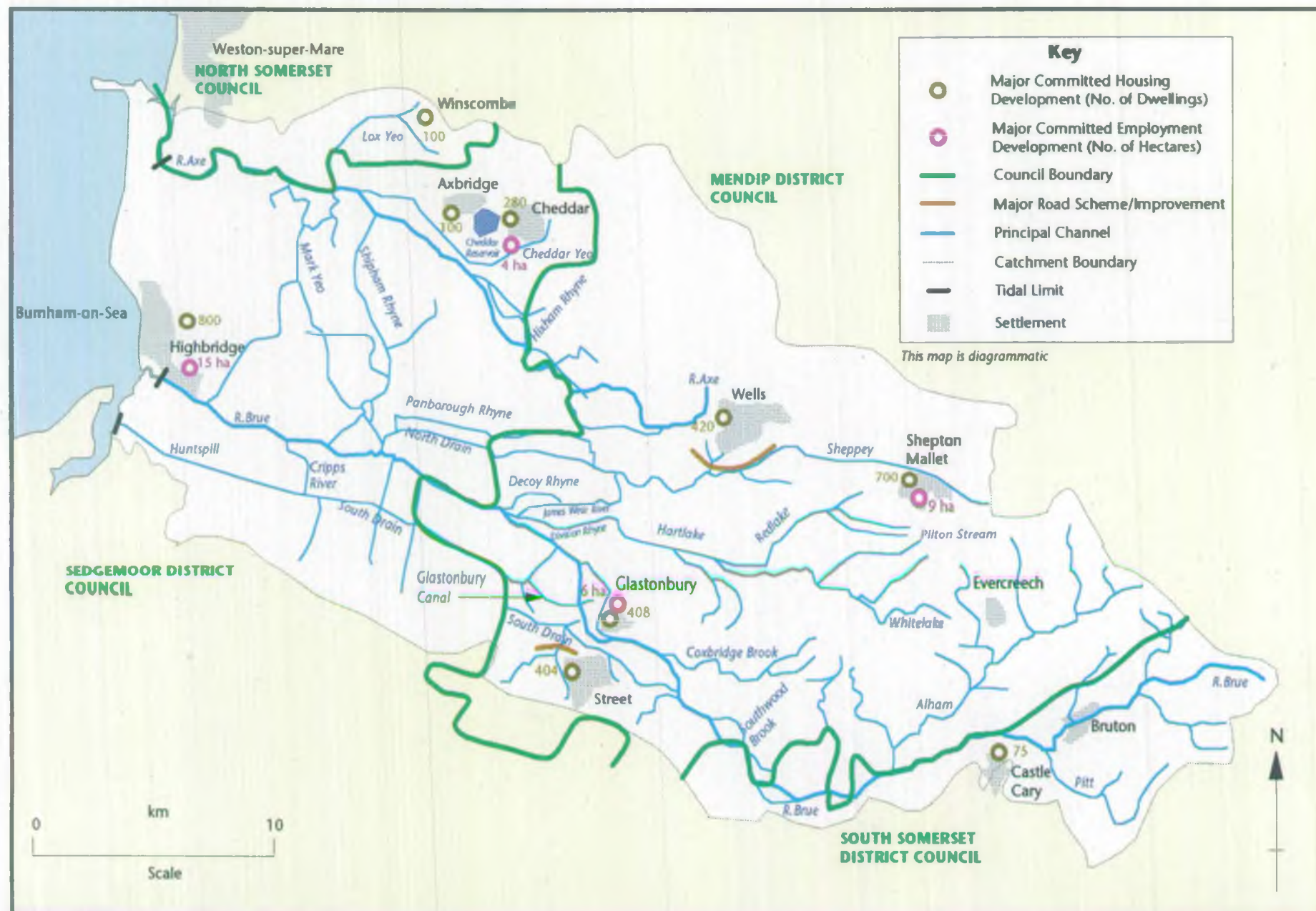
The Agency has a duty to make a contribution to sustainable development. We can assist local authorities to allocate land for development by commenting on Local Plans, identifying constraints and highlighting where the environment can be enhanced by sympathetic development.

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.

Table 12 Local Plans covering the Brue and Axe Catchment

District	Population in Brue and Axe LEAP area	Plan	Notes on planned development
Sedgemoor	44,000 approx.	Bridgwater Area Local Plan. (covering the Polden villages) Adopted August 1995. Burnham-on-Sea Area Local Plan. Adopted April 1990. Cheddar Area Local Plan. Adopted October 1994.	Approximately 1,700 additional dwellings will be accommodated in the part of Sedgemoor within this catchment by 2001. The majority of this will be located in Burnham-on-Sea, Highbridge and Cheddar. Existing planning permissions and commitments total about 1600 units. Approximately 20 hectares of employment land are also identified in existing local plans.
Mendip	54000 approx.	Glastonbury and Street Local Plan. Adopted March 1994. Wells Local Plan. Adopted April 1989. Shepton Mallet Local Plan. Adopted September 1993. Mendip Hills Local Plan. (Prepared by Somerset County Council.)	2,600 dwellings and 32 hectares of employment land between 1996 and 2011 for the district as a whole. Outstanding residential commitments within the catchment amount to just under 1000 dwellings whilst approximately 15 ha of employment land remains to be built under the existing local plans.
South Somerset	6600 approx.	Wincanton Local Plan. Adopted June 1987.	
North Somerset	4000 approx.	Weston-super-Mare Local Plan. Adopted August 1988.	Apart from an outstanding commitment for 100 houses at Winscombe, the population in this area is not expected to grow to any extent.

Map 25 Built Environment and Development



17. Water Abstraction and Supply

Water is abstracted within the Brue Catchment for public water supply and for private water use, including the supply of water for industrial, agriculture, fish for sport and amenity purposes. In addition, some isolated domestic users rely on water from private sources. All 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 volume of water theoretically available in the Brue Catchment is 230,000 MI/year. This volume represents the proportion of rainfall that is not taken up by plants or evaporated and is therefore available to recharge the groundwater or to flow in rivers. The current annual net resource commitment for the Brue Catchment is 38,527 MI or an average of 106 MI/d.

Compared with the catchment's annual natural water resource the volume of licensed surface and groundwater does not give cause for concern. However some local environmental problems in the catchment are linked to the abstraction of water (see Issue 3.1).

The net resource commitment excludes unlicensable uses of water, the most significant of which is for wet fencing. Wet fencing is not covered by the Water Resources Act 1991 but is controlled locally by Internal Drainage Boards (IDBs). However subsequent abstraction for uses such as spray irrigation is licensed and controlled by the Agency.

Table 13 Licensed Abstractions

	Number of Licences	Annual authorized volume (MI/d)	% of Total
Groundwater	196	40	18
Surface water	42	183	82
Total	238	223	100

Note: Annual authorized volume is expressed as a daily average.

Although licensed abstractions from surface sources dominate in the Brue catchment there is a significant volume of licensed groundwater abstraction (see Table 13). This reflects the catchment's hydrogeology (see Section 4.4 and Map 3). By volume the largest licensed groundwater and surface water uses are for public water supply. Consumptive uses involve the loss of some of the water abstracted. Non-consumptive uses return most of the water abstracted to the catchment. Consumptive uses account for 73% of the groundwater and 78% of the surface water abstracted annually. The majority of licensed consumptive use is for public water supply.

17.1 Public Water Supply

Both Wessex Water Services Ltd (WWSL) and Bristol Water (BW) provide mains public water supply within the catchment. Most of the catchment is covered by BW's supply area but a small proportion in the south east lies within WWSL's Somerset Supply Zone.

To supply its customers within the Brue and Axe Catchment BW abstracts water from surface and groundwater sources in the catchment. The company may also bring in water from resources outside the catchment via the company's supply grid. Conversely, water from many of the company's resources in the Brue Catchment can be piped through the grid to meet demand elsewhere in the Bristol Water supply area.

WWSL meets its customer demand in the Brue and Axe Catchment from two spring sources in the south-east part of the catchment. These can be supplemented by bringing in water from sources in West Somerset. There is also an arrangement between WWSL and BW to transfer water between their respective distribution systems on the Street/Somerton axis. The proportion of demand in the Brue

arising from WWSL's customers is very small. This part of public water demand in the catchment is not considered further in this Report.

As a whole, Bristol Water currently has available resources totalling 337 MI/d, excluding resources dedicated to bulk supply. This is the reliable yield of all the company's resources including those outside the Brue Catchment. Sources within the Brue and Axe Catchment represent about 30% of this reliable yield. With average demand in the early 1990s of 310 MI/d the company enjoys a surplus in resources over demand of some 17 MI/d. However this surplus is threatened by predicted growth in demand (see Issue 3.7).

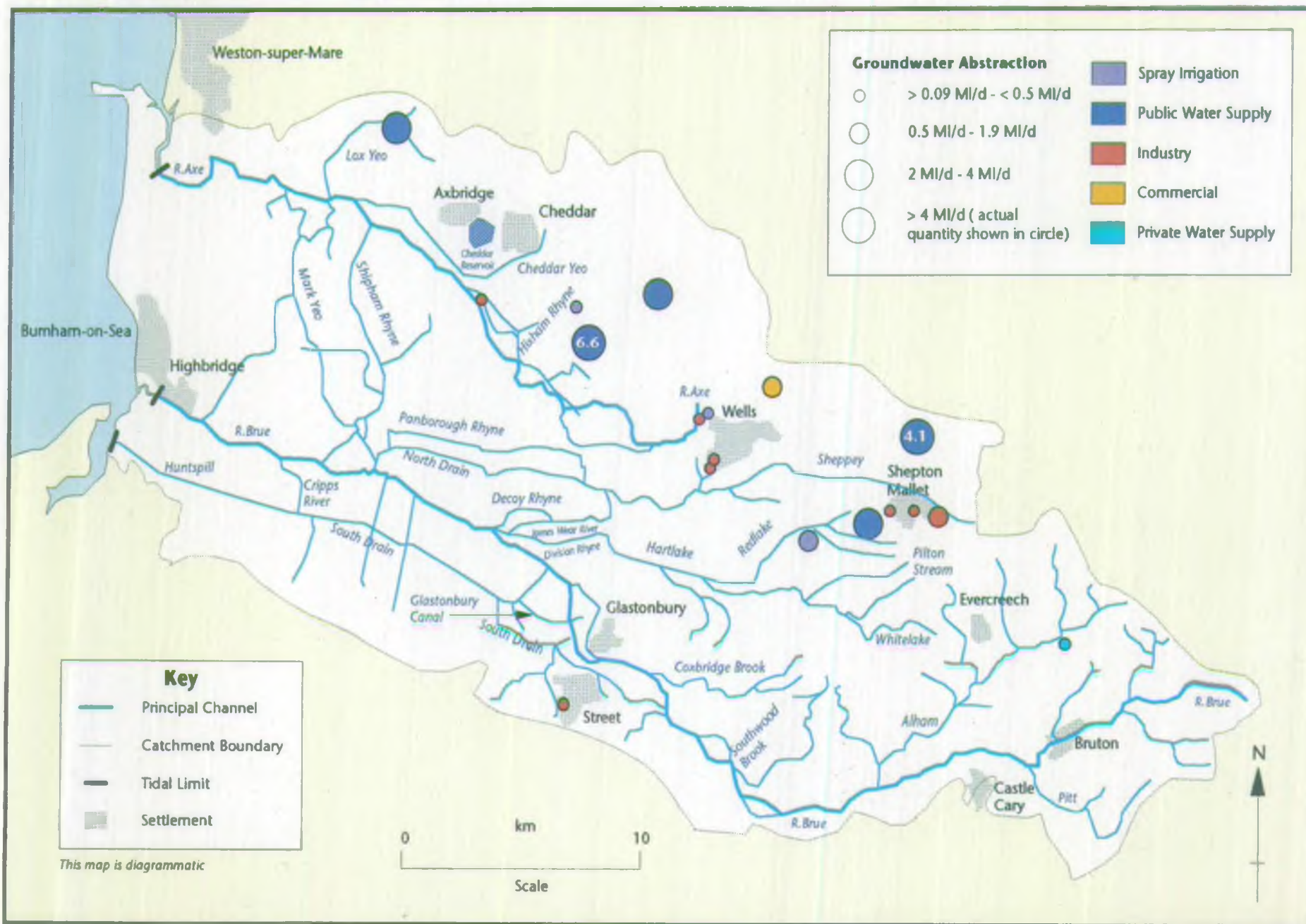
BW has 10 licences to abstract water within the Brue Catchment (See Table 14). These authorize a total maximum abstraction of 321 MI/d at any given time. Seven are groundwater licences but the biggest proportion of the authorized abstraction comes from the three surface licences (see Map 27).

Table 14 Licensed Public Water Supply Sources

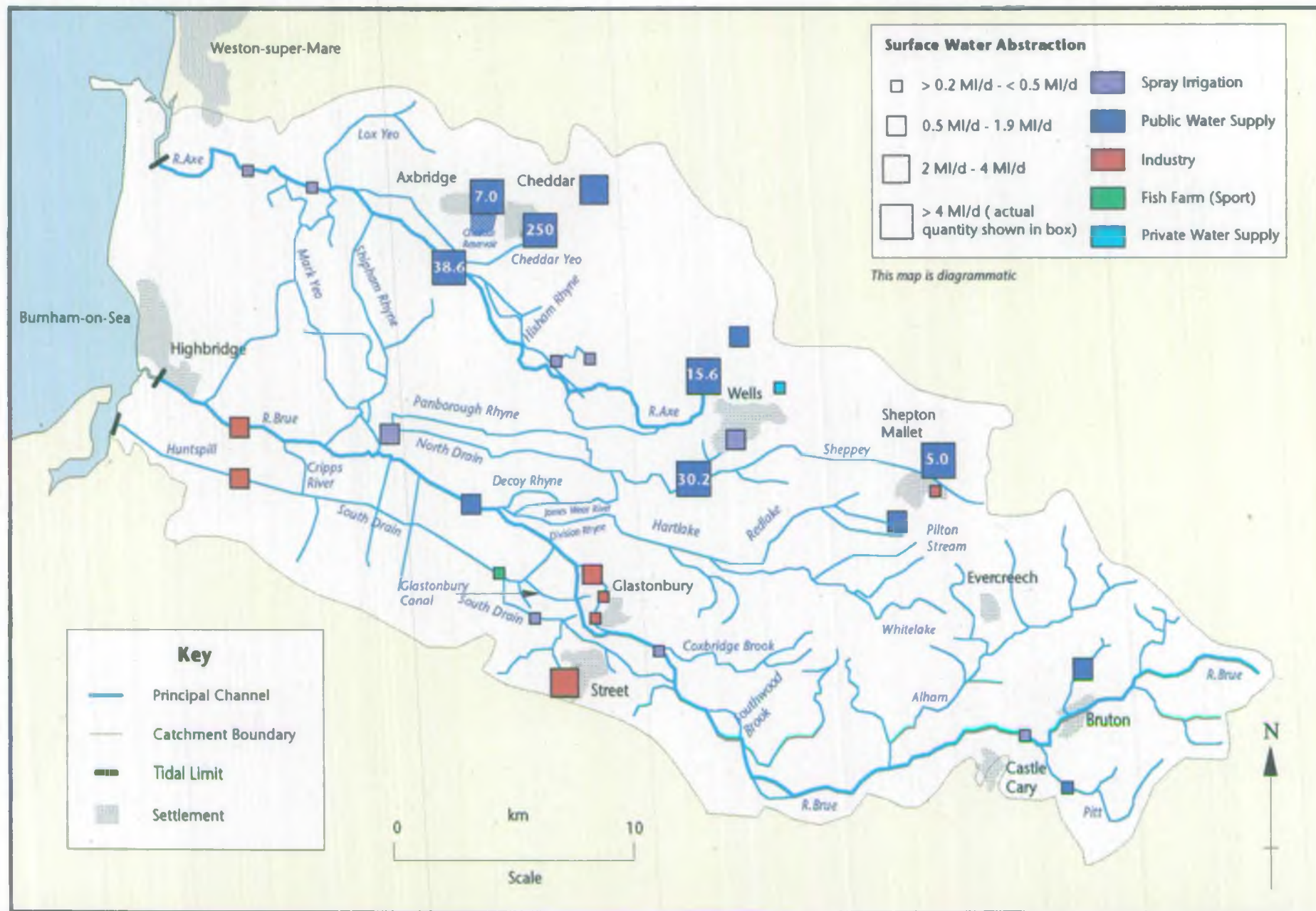
Source	Daily licensed quantity MI	Annual licensed quantity MI	Comments
Surface water			
Cheddar	250	24000	Bristol Water. Spring source diverted to the Cheddar Yeo. Restricted to two-thirds annual quantity May to October. Seasonal flow conditions.
Brinscombe	38.64	4750	Bristol Water. River abstraction. No abstraction between May and October. Flow conditions.
Ellenge	7	500	Bristol Water. River abstraction. Flow restriction May to September. Compensation flow between October and April.
Total Surface Water	295.64	29250	
Groundwater			
Rodney Stoke	6.6	1500	Bristol Water. Borehole abstraction. Seasonal restriction between May and October.
Shepton Mallet	5	1000	Bristol Water. Springs and borehole abstraction.
Charterhouse	4.1	1000	Bristol Water. Springs abstraction.
Winscombe	3.41	950	Bristol Water. Borehole abstraction.
Holes Ash	1.9	450	Bristol Water. Springs abstraction.
West Compton	1.82	450	Bristol Water. Springs and borehole abstraction.
Priddy	1.14	320	Bristol Water. Borehole abstraction.
Kingswood Warren	1.023	227.305	Wessex Water. Springs abstraction.
Pitcombe	0.546	181.84	Wessex Water. Springs abstraction.
Total Groundwater	25.539	6079.145	

BW's key resource in the catchment is the huge abstraction to the Cheddar Yeo. The company has a licence to abstract water from springs in the vicinity of Cheddar Gorge which it then diverts to an intake on the Cheddar Yeo. This abstraction provides raw water for Cheddar treatment works in conjunction with Cheddar Reservoir and for Blagdon Lake. The other key resource available to the company in the River Brue Catchment is Brinscombe abstraction from the River Axe.

Map 26 Groundwater Abstractions



Map 27 Surface Water Abstractions



18. 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 21).

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 5).

The following EC directives affect the control of aqueous discharges in this catchment. For more information see Section 5 and Section 25.2.

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

Discharge consents can only be used to control point source discharges. Diffuse sources of pollution such as agricultural runoff and much urban/highway runoff has to be tackled using other regulatory powers.

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.

18.1 Continuous Discharges

18.1.1 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 21 STWs (see Map 28).

The largest STW is West Huntspill which treats sewage from the Burnham and Highbridge localities. 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. The nearby Weston-super-Mare STW is much larger but this lies just outside the scope of this plan. (It will be covered more fully in the North Somerset Rivers LEAP and the Severn Estuary Joint Issues Report). Its outlet is close to the mouth of the Axe Estuary and therefore has an effect on water quality in the tidal part of the River Axe.

Next in order of size are the STWs at Wells (see Issue 3.10), Glastonbury and Shepton Mallet, these being the 3 largest towns in the east of the catchment. A large proportion of the loading on Shepton Mallet STW (see Issue 3.10) derives from cider production activities in the town.

There are no substantial private STWs in the LEAP area but those that have a consented BOD loading of > 0.3 kg/day are shown on Map 29. Extensive parts of the area covered by this plan are unsewered and therefore there are many small domestic treatment plants in operation. "First-time sewerage"

schemes are being considered for North Wootton, Blackford, Alhampton, Lympham and possibly Biddisham.

18.1.2 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 Brue Catchment Wessex Water are committed to improving Doultling STW, on the River Sheppey, under the containment of effluent load provision. The works has a descriptive consent and is approaching the 250 population equivalent permitted for descriptive consents. The treatment of effluent will be improved by the installation of a reed bed. The much larger STW at Shepton Mallet also discharges to the Sheppey and improvements may be required to the works.

The much larger STW at Shepton Mallet, also discharging to the River Sheppey, is on a 'reserve list' of sites which will be improved if cost savings remain following improvements at priority works. Shepton Mallet STW was confirmed as having failed its consent for BOD and suspended solids in the last return period to OFWAT (01/04/95 - 31/03/96) for the annual Quality Discharge Consent Compliance report.

There are no urban waste water treatment schemes in the catchment.

18.1.3 Trade effluents

Most trade effluents are discharges to the catchment via STWs; there are few major consented trade discharges (see Map 29). The largest, Royal Ordnance Plc, is now regulated by means of an IPC Authorization (see Issue 3.6). The effluent from St Cuthberts Paper Mill (see Issue 3.12) discharges near Wookey Hole, the source of the River Axe. The location necessitates the setting of a stringent ammonia limit (5 mg/l). The consent for the treated leachate from Walpole Drove landfill site contains limits for a range of pesticides as well as List I and List II metals. (Note this site is actually within the Parrett LEAP area but the discharge falls in this Plan area).

There is only one aqueous discharge from an IPC authorized site - Royal Ordnance Plc acid ditch.

18.2 Intermittent Discharges

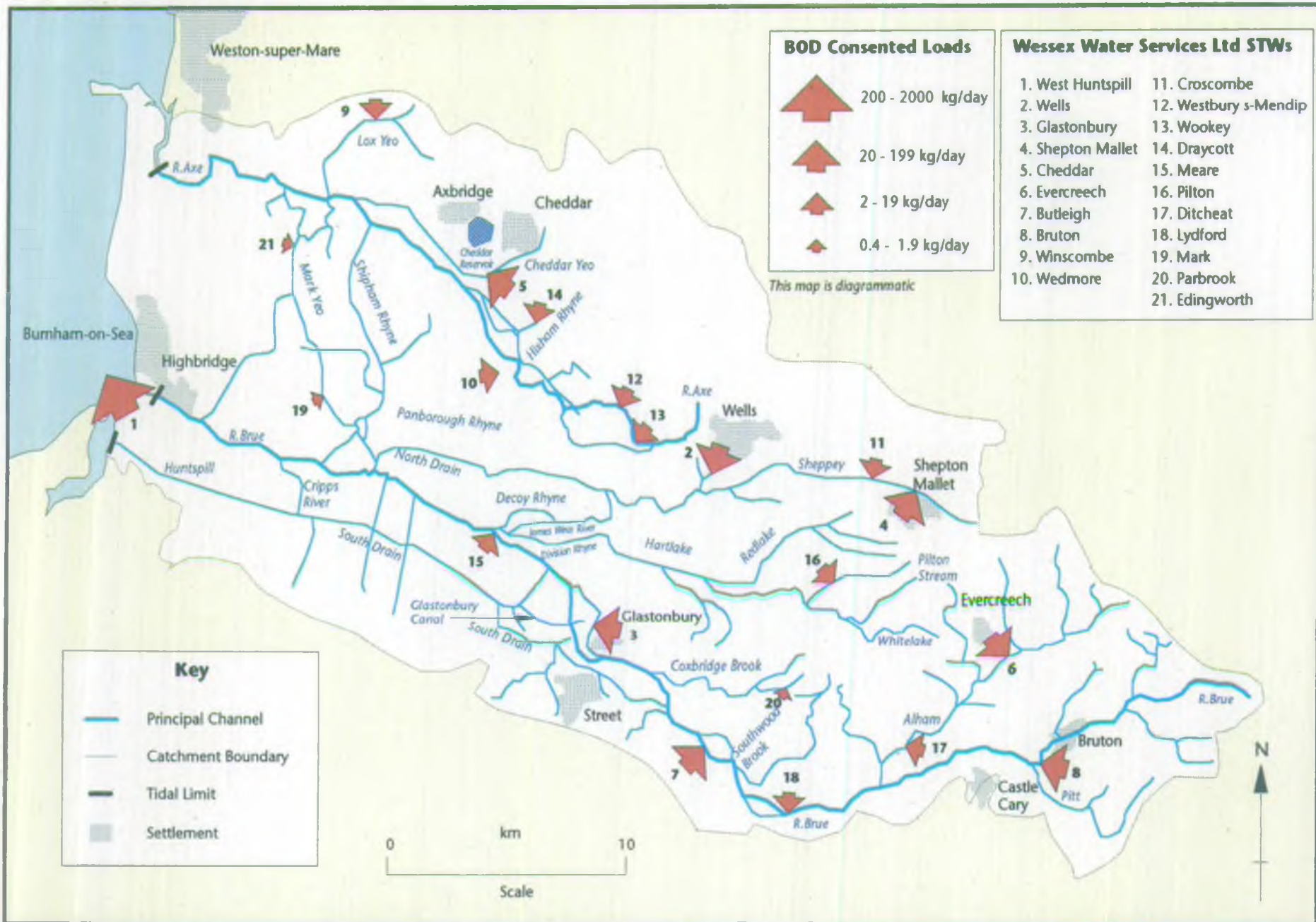
These include sewer storm overflows and sewage pumping station emergency overflows. These are mainly associated with urban areas as are discharges of contaminated surface runoff.

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.

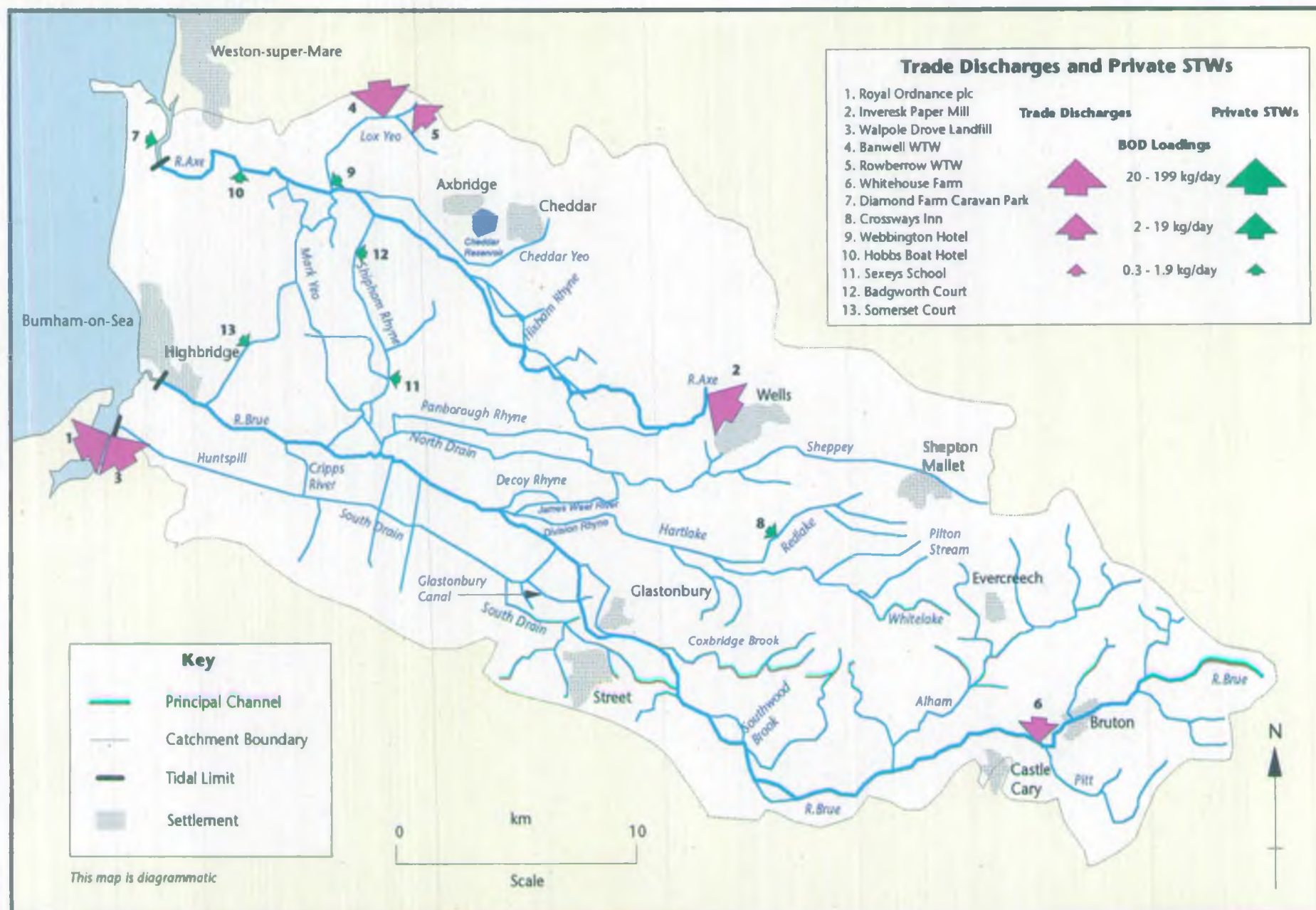
18.3 Discharges to Ground

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 Brue and Axe river catchments are level, low-lying clay ground and soakaway problems are widespread e.g. the villages of Mark, Lympham, Badgworth and Blackford. The opposite situation is encountered high in the Mendips where the River Axe has its source near to Priddy. Here, the subsoil and bedrock can be very fast-draining due to the underlying limestone which increases the risk of groundwater contamination. As a consequence, septic tanks are unlikely to be approved for any new developments in this area. (See Issue 3.11).

Map 28 Wessex Water Services Ltd - STWs



Map 29 Other Discharges



19. Aquaculture

There are currently no cress farms or fish farms in the Brue and Axe Catchment, although these are possible afteruses for the Peat Production Zones once the peat is extracted.

20. Farming and forestry

20.1 Farming

The Brue Catchment is predominantly agricultural with 93% of land devoted to agriculture (63,000 ha) compared with the national figure of just over 80%. 66% of this land is in the three highest Grades (Grades 1-3) compared with the national figure of 60%.

The breakdown of land use type for 1994 is shown below. Improved pasture for dairying was the predominant land use type. However, because of BSE and changes in farming economics, the position is now changing quickly. Many small livestock farms are being sold and suitable land is being used for wheat production, for which there is a guaranteed market. Some peatland farmers are considering a move to root vegetable production but there are concerns about permanent damage to the land if the practice is continued beyond approximately ten years. More water would be required for irrigation. More land is being put into the Environmentally Sensitive Area (ESA) scheme (see below) for management with higher water levels and other traditional farming practices.

Table 15 Agricultural Land Use Type

Land Use Type (1994 MAFF)	%
Grassland > 5 years old	11
Grassland < 5 years old	71.7
Rough Grazing	3.1
Arable and Fallow	10.9
Farm Woodland	1.1
Set aside	1.4
Other land	0.8

The catchment is predominantly Grade 3 and is used as grassland supporting specialist dairy and beef farming with some arable. The Polden Hills, Mendip Hills and the Wiltshire border support most of the woodland found in the catchment. The best agricultural land (Grades 1 & 2) is a scarcer resource within the catchment than in Somerset as a county and also in comparison with the national picture. A large part of the catchment is Grade 4 as a result of flood risk, whereas very little is of truly marginal agricultural potential (Grade 5).

The northern half of the Somerset Levels and Moors Environmentally Sensitive Area (ESA) is within the Brue Catchment. Here the traditional farming practices which have helped to create or protect distinctive landscapes, wildlife habitats and historic features have increasingly given way to more intensive methods. The purpose of the MAFF scheme is to support the continuation of these traditional practices and to encourage measures that will enhance the environment. ESA management agreements include conditions to maintain or raise water levels. There is also a payments tier for increased public access.

Over the past ten years there has been a shift from grassland to arable. The area devoted to arable has increased by 8.2% over the period 1984-94. This includes the growing of maize for cattle food.

20.1.1 Farm problems

On the flood prone moors traditional farming practices have developed to accommodate these circumstances. Adaptations include the use and maintenance of wet fences (see Issue 3.1) and portable milking bales. It is only relatively recently (since arterial drainage schemes were constructed this century) that large scale intensification of grassland management has been possible. Arable crops can now also be grown over large areas. Modern farming methods can create risks of pollution and

soil loss or damage (see Issue 3.9). The Agency works with organisations such as MAFF and Farming and Wildlife Advisory Group (FWAG) to encourage farmers to adopt more environmentally friendly farming practices.

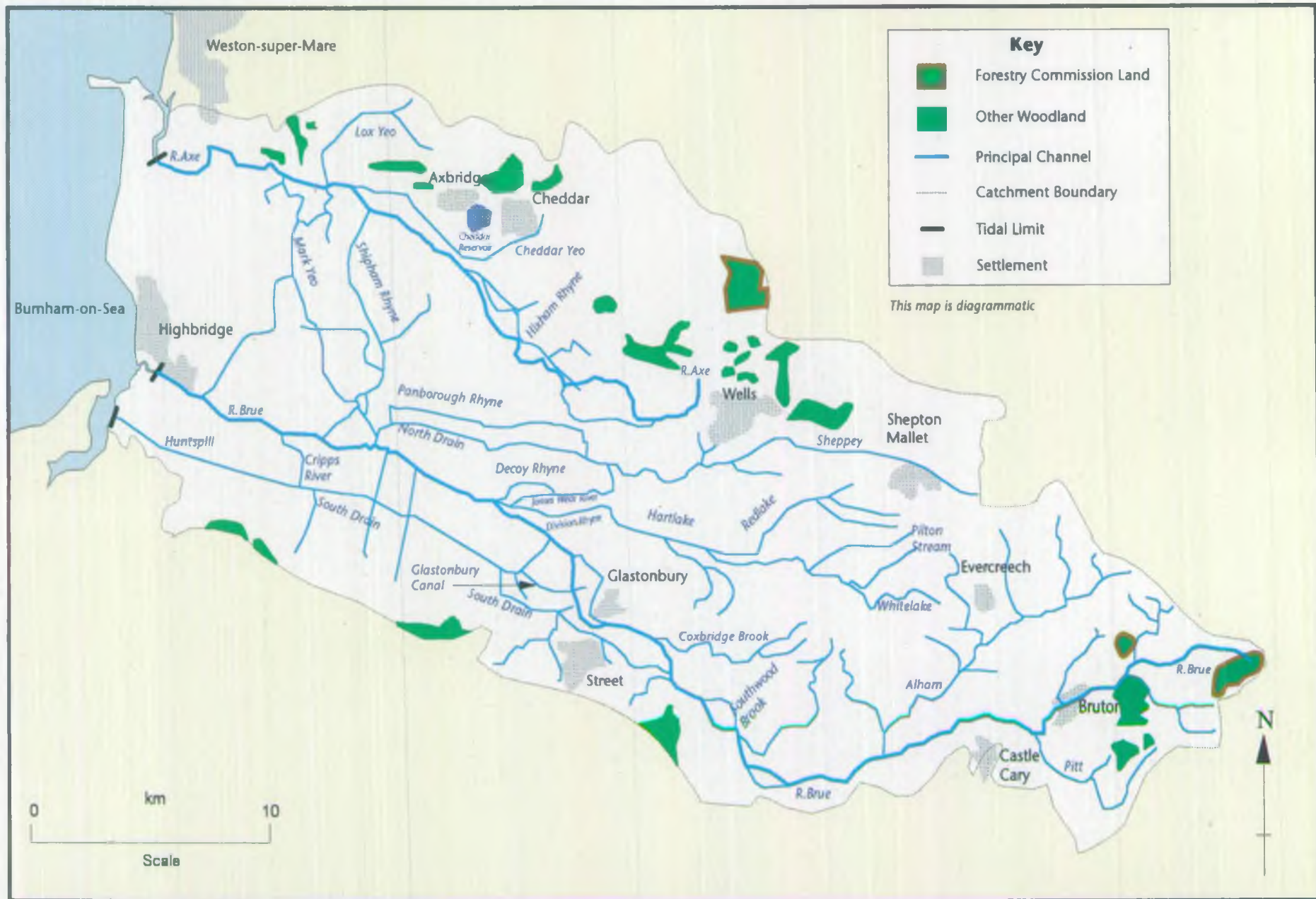
20.2 Forestry

Less than 5% of the Brue and Axe Catchment is forested. However MAFF statistics show that in 1994 1.1% (680 ha) of farmland in the catchment was farm woodland, an increase of 30.7% since 1984. This is in part due to improved planting grants and compensation for loss of agricultural production which have been available during the decade. Forest Enterprise manage woodland at the head of the River Brue and north of Wells. The remaining woodland is privately managed.

The Polden Hills, Mendip Hills and the eastern border support most of the woodland found in the catchment. There is little woodland in the floodplains of rivers. (See Map 30 for the distribution of woodland and Forestry Commission ownership within the catchment).

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 Somerset Levels and Moors pollarded willows along the river margins are a characteristic feature.

Map 30 Forestry



21. 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 minimise 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 16) by process type and summarize the most significant releases to air permitted by their authorizations. Direct discharges to water are summarized in Section 18.

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 16 Part A Process Operators

Operator	Description of process(es)	Main authorized releases to air
Royal Ordnance Plc Puriton	Chemical and recovery processes: The manufacture or recovery of nitric, sulphuric, acetic acids and mixed acids. The manufacture of organic chemicals, mainly explosives.	Sulphur dioxide Nitrogen oxides Volatile organic compounds
ARC Southern Ltd Cheddar	Mineral process: The production of lime	Particulate matter Nitrogen oxides
ICI Polyurethanes Ltd Shepton Mallet	Chemical process: The manufacture of organic chemicals	Volatile organic compounds

22. The Storage, Use and Disposal of Radioactive Material Including Nuclear Licensed Sites

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.

There are 8 sites in the catchment area which are currently registered under the Radioactive Substances Act. These sites are mainly manufacturing processes using sealed radioactive sources for industrial process control purposes.

The current registered users of radioactive substances in the catchment are shown in Table 17.

Table 17 Current registered users of radioactive substances

Site	Use
Royal Ordnance Plc, Puriton	Registered for sealed sources used in industrial process control.
ARC Southern Ltd Cheddar	Registered for sealed sources used in industrial process control.
Inveresk Plc Wells	Registered for sealed sources used in industrial process control.
Matthew Clark-Gaymer Shepton Mallet	Registered for sealed sources used in industrial process control.
Keevil Engineering Ltd Doulting	Registered for sealed sources used in industrial process control.
John Wainwright & Co Ltd Stoke St Michael	Registered for sealed sources used in industrial process control.
W S Atkins (South West) Ltd Materials Laboratory Wells	Registered for sealed sources used in quality control of road building projects.
Kings School Barton	Registered for sealed sources used for educational purposes.

There are no users authorized for the keeping or disposal of radioactive waste within the LEAP area.

Part 3

23. Area Environment Group

<u>Name</u>	<u>Representing</u>
Mr P W Lacey	Chairman, Appointed by Environment Agency
Ms B Carroll	Regional Env. 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 J R Moffat	Industry
Mr H S Lucas	Industry
Mrs C M Mack	Tourism
Mr R G Adlam	Agriculture
Ms J C Brookhouse	Conservation
Mrs A M Lennox	Recreation
Mr J L R Williams	Fisheries
M J B H Watkis	Flood Defence
Mrs L Bennett	Local Authority
Mr H P N Temperley	Local Authority
Mrs N E Kirsan	Local Authority
Mr E H Hodges	Local Authority
Dr R England	Education

24. Steering Group

<u>Name</u>	<u>Representing</u>
Mr I Ham	National Farmers Union
Mr P Hodge	Bristol Water Company
Mr N House	Royal Ordnance Plc
Mr J Mathrick	Fisheries
Dr C Hancock	Somerset Wildlife Trust
Mr R Bradford	English Nature
Mr P Daniel	Wyvern Waste
Capt P Lee	Sedgemoor District Council
Mr R Moon	Somerset County Council
Mr R Shearwood-Porter	Inveresk Plc, St Cuthberts Paper Mill
Mr D Hooper	Mendip District Council
Mr J Comer	Country Landowners Association
Mr N Gibson	British Canoe Union
Mr J B H Watkis	Internal Drainage Boards
Mr I Blair	Wessex Water Plc
Mr R Bond	Somerset Peat Producers Association
Mr C Birks	Chairman

25. Our 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 & development reports, and information leaflets. Further details are available from our local offices.

25.1 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>.

25.2 EC Directives

There are six EC Directives which currently apply to the Brue and Axe Catchment. The designated stretches and sites are shown on Map 7.

25.2.1 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. The other set of standards that are stricter, protects salmonid fish populations for example, salmon and trout.

We are responsible for monitoring the quality of identified fisheries and reporting the results to DoE 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.

25.2.2 EC Dangerous Substances Directive

The EC Dangerous Substances 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 (consenting), 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 DoE 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.

25.2.3 EC Urban Waste Water Treatment Directive

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

This Directive specifies secondary treatment 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 AMP2 guidance note. We are responsible for making sure that discharges receive the level of treatment specified in this Directive.

This Directive also allows 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.

We carry out monitoring to find out whether a watercourse is a sensitive area. We present this information to DoE who decide whether the watercourse is sensitive. We then ensure that discharges to the sensitive area 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.

25.2.4 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, estuarial and coastal waters to identify those that are or could be affected by nitrate from diffuse agricultural sources. Regular reviews must be carried out of existing and potential new Nitrate Vulnerable Zones (NVZs). The first must be completed in December 1997, and then at four year intervals. The land draining to these polluted waters must be designated as nitrate vulnerable zones. Action plans must be established by the Member States to reduce existing nitrate pollution and prevent further pollution. Outside NVZs, Member States must establish and promote a code of good agricultural practice.

We are responsible for advising on the selection and catchment boundaries for NVZs. The Government is responsible for the designation of NVZs, the determination of the actual NVZ boundary (based on

field boundaries) and the drawing up of Action Plans which set out those agricultural measures to be adopted.

If the nitrate concentration in fresh waters exceeds 50 mg/l or is likely to if measures are not taken, then the catchment should be considered as an NVZ.

25.2.5 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 imperative standards that must be achieved, and guideline standards that Member States should aim to achieve, 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 DoE 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.

25.2.6 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. We ensure that the principles of the Groundwater Directive are implemented through our waste management activities and by controlling the discharge of effluents to soakaways. There are no statutory standards for the quality of groundwater, and because of the difficulties in obtaining and interpreting information we have only a limited understanding of 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.

25.3 Our River Quality Objective Targets

The table below details the 45 river reaches in the Brue and Axe Catchment and the RQO and Long Term RQO targets we have set for them.

Table 18 Our River Quality Objective Targets

Stretch Ref. No	River	Stretch	Proposed RQO	Proposed Long Term RQO
1	Huntspill	Gold Corner - Sea	RE 4	
2	South Drain	Source - Avalon Farm	RE 4	
3	South Drain	Avalon Farm - Confluence with Gold Corner	RE 4	
4	Brue	Cogley Wood - Gants Mill	RE 2	
5	Brue	Gants Mill - Cole	RE 2	
6	Brue	Cole - Wadham Farm Stream	RE 2	
7	Brue	Wadham Farm Stream - Confluence with Alham	RE 3	RE 2
8	Brue	Confluence with Alham - D/S Baltonsborough Bifurcation (North)	RE 2	
9	Brue	U/S Baltonsborough Bifurcation - D/S Baltonsborough Bifurcation (South)	RE 2	
10	Brue	D/S Baltonsborough Bifurcation - D/S Glastonbury Mill Stream Bifurcation	RE 3	
11	Brue	D/S Glastonbury Mill Stream - Confluence with Sheppey	RE 3	
12	Brue	Confluence with Sheppey - Confluence with North Drain	RE 3	
13	Brue	Confluence with North Drain - Confluence with Cripps	RE 3	
14	Brue	Confluence with Cripps - Highbridge (Estuary)	RE 4	
15	North Drain	Crossing with Sheppey - Confluence with Brue	RE 4	
16	Sheppey	Shepton Mallet STW - Croscombe STW	RE 3 (2000)	
17	Sheppey	Croscombe STW - Dulcote	RE 3	
18	Sheppey	Dulcote - Garslade Farm	RE 3	
19	Sheppey	Garslade Farm - Confluence with Brue	RE 2	
20	Keward Brook	Keyward - Confluence with Tributary	RE 2	
21	Keward Brook	Confluence with Tributary - Confluence with Sheppey	RE 4	
22	Decoy Rhyne	U/S Decoy Rhyne - D/S Decoy Rhyne	RE 2	
23	Hartlake	Redlake/Whitelake Confluence - Confluence with Sheppey	RE 4	RE 3
24	Whitelake	Confluence with Whitelake Tributary - Confluence with Redlake	RE 3	
25	Brue (GMS)	U/S Glastonbury Mill Stream Bifurcation - D/S Glastonbury STW	RE 3	
26	Brue (GMS)	D/S Glastonbury STW - D/S Glastonbury Mill Stream Bifurcation	RE 4	RE 3
27	Cripps	Confluence with Huntspill (Gold Corner) - Brue Confluence	RE 4	
28	Alham	Alham - Snagg Farm	RE 2	
29	Alham	Snagg Farm - Confluence with Alham Tributary	RE 3	RE 2
30	Alham	Confluence with Alham Tributary - Confluence with Brue	RE 2	
31	Axe	Source - Paper Mill	RE 1	
32	Axe	Paper Mill - U/S Wookey Bifurcation	RE 2	
33	Axe	U/S Wookey Bifurcation - D/S Wookey Bifurcation	RE 2	
34	Axe	U/S Wookey Bifurcation - D/S Wookey Bifurcation (via Wookey STW)	RE 2	
35	Axe	D/S Wookey Bifurcation - Clewer	RE 2	
36	Axe	Clewer - Confluence with Cheddar Yeo	RE 4	RE 3
37	Axe	Confluence with Cheddar Yeo - Confluence with Lox Yeo	RE 4	
38	Axe	Confluence with Lox Yeo - Confluence with Mark Yeo	RE 4	
39	Axe	Confluence with Mark Yeo - Brean (Estuary)	RE 4	
40	Lox Yeo	Source - Winscombe STW	RE 3	
41	Lox Yeo	Winscombe STW - Loxton	RE 4	
42	Lox Yeo	Loxton - Confluence with Axe	RE 5	RE 4
43	Cheddar Yeo	Source - Hythe	RE 1	
44	Cheddar Yeo	Hythe - Hythe Footbridge	RE 2	
45	Cheddar Yeo	Hythe Footbridge - Confluence with Axe	RE 3	

26. The Somerset Levels and Moors Water Level Management and Nature Conservation Strategy

SUMMARY

The Environment Agency has a statutory duty to further the conservation of the wildlife, landscape and archaeology of watercourses and wetlands under Sections 8 and 9 of the Water Act 1989 (as amended). The nature conservation interest of the Somerset Levels and Moors is deteriorating; concern has been expressed over the gradual drying out of the Moors with particular reference to the Sites of Special Scientific Interest. The Somerset Local Flood Defence Committee has examined the situation and has put forward the following strategy:

- 1 The Environment Agency recognizes the outstanding nature conservation interest of the Somerset Levels and Moors and that this is in decline.
- 2 The Agency seeks to restore and maintain the wildlife and landscape of this internationally important wetland, consistent with its given duties, and to conserve the archaeological interest.
- 3 The Agency has statutory obligations as regards water management, including the control of water abstraction, discharges, water quality, drainage and water levels.
- 4 The Agency will give special consideration to the environmental impact of abstraction and discharges throughout the Levels and Moors.
- 5 The Agency will review its flood defence practices and take into account the requirements for nature conservation, to ensure sympathetic management within the Environmentally Sensitive Area (ESA). Formal management plans will be agreed with English Nature (EN) over activities which affect Sites of Special Scientific Interest (SSSIs). English Heritage will be consulted over matters that affect Scheduled Ancient Monuments (SAMs).
- 6 The Agency will adopt a presumption in favour of positive water level management for nature conservation on SSSIs, and in other appropriate areas where there is general agreement. Priority will be given to the core areas of SSSIs.
- 7 Where raised water levels affect agricultural productivity the Agency will support the introduction of a water level premium on ESA payments and/or Section 15 management agreements with English Nature to offset these costs.
- 8 The Agency will liaise with relevant organisations to draw up a list of priority sites where enhanced water levels are required to maintain and restore the nature conservation interest.
- 9 The Agency will take action after consultation with the Ministry of Agriculture, Fisheries and Food, English Nature, Internal Drainage Boards and landowners in order to achieve the conservation objectives.
- 10 The importance of the 'withy' growing industry is fully recognised and in implementing its strategy the Agency will seek to accommodate its special requirements.
- 11 In implementing the strategy the Agency will take special account of the statutory, practical and financial position of Internal Drainage Boards.
- 12 Any changes in strategy must ensure that there is no increase in flood risk to human life, habitation or communications.

The success of the proposed strategy will depend on co-ordinated action by many different individuals and organisations. The Environment Agency believes that this strategy represents an important opportunity to safeguard the special character of the Somerset Moors.

27. Glossary of Terms

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
BATNEEC	Best Available Techniques Not Entailing Excessive Cost
BAP	Biodiversity Action Plan
BCU	British Canoe Union
BOD	Biochemical Oxygen Demand
BPEO	Best Practicable Environmental Option
BW	Bristol Water
CMP	Catchment Management Plan
CWS	County Wildlife Site
DoE	Department of the Environment
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
GSPA	Groundwater Source Protection Area
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
HMSO	Her Majesty's Stationery Office
HNDA	High Natural Dispersion Area
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
LNR	Local Nature Reserve
LSO	Long Sea Outfall
LTA	Long Term Average
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
NVZ	Nitrate Vulnerable Zone
OFWAT	Office of Water Services, the government regulatory agency for the water industry
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
RQO	River Quality Objective
SAC	Special Area of 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
SoS	Standards of Service
SPA	Special Protection Areas identified by UK Government under the EC Directive on the Conservation of Wild Birds
SSO	Storm Sewer Overflow
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 Regulatory 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	µg/ m ³	microgram per cubic metre
km ²	square kilometre	MI/y	megalitres per year	t/year	tonnes per year
ha	hectare	ppm	parts per million	kg/day	kilograms per day
ml	millilitre				

29. References

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- EC Directive on Freshwater Fish (78/659/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 (80/86/EEC)
- EC Directive Concerning Urban Waste Water Treatment (91/271/EEC)
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- Guidance for the Control of Invasive Plants near Watercourses, Japanese Knotweed, Giant Hogweed and Himalayan Balsam. HO-9/94-20k-C-AKVI
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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.

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

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