local environment agency plan

RIVER PARRETT

CONSULTATION REPORT

MARCH 1997

ENVIRONMENT AGENCY

GA SOUTH WEST
LEVELS

FOREWORD

This 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 document.

This holistic approach is now reflected in this Plan. It is a logical development of the Catchment Management Plans prepared by the old 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 River Parrett and its tributaries, the Rivers Isle, Yeo, and Cary encompasses a varied and complex environment, which includes a major part of the important Somerset Levels and Moors. This is the first Local Environment Agency Plan (LEAP) produced in North Wessex Area. It 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)

YOUR VIEWS

We hope that this 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?

Can you suggest new issues or Options for Action?

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 30 June 1997.

HOW TO USE THIS PLAN

For advice on how to use this plan please see Section 2.

THE NEXT STAGE

We will collate responses to this Report and publish an Action Plan in October 1997. Each year we will review the progress that has been made with the actions identified in the Action Plan and publish a brief review. We intend to publish a combined Local Environment Agency Plan for the Parrett and Tone catchments by November 1999.

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

Published March 1997

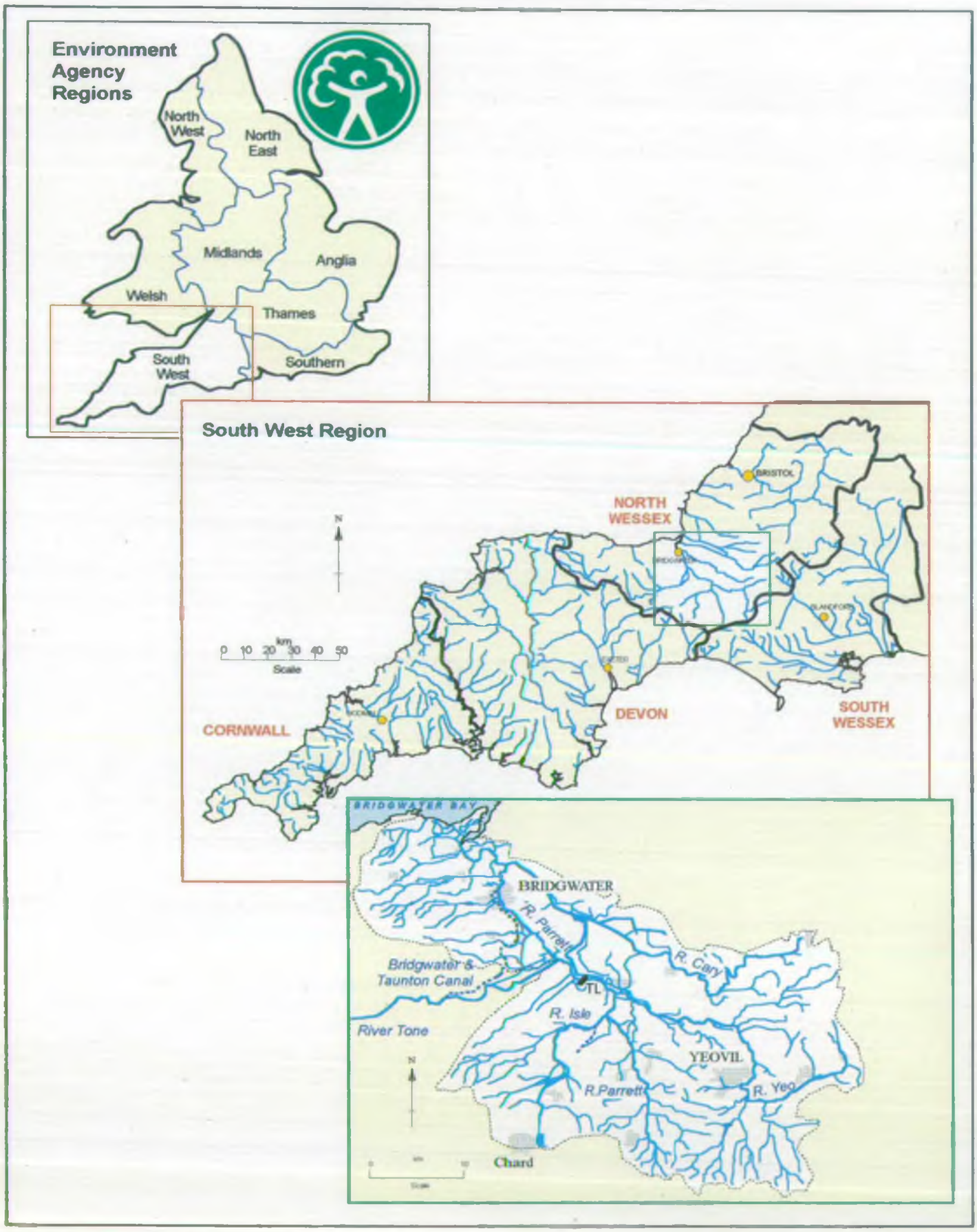
CONTENTS

LIST OF MAPS

LIST OF TABLES

LIST OF FIGURES

Map 1 - River Parrett Catchment Location



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River Parrett Local Environment Agency Plan
Environment Agency

OUR MISSION AND AIMS

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 and timely warning systems for people and property against flooding from rivers and the sea.
- To achieve significant reductions in waste through minimisation, reuse and recycling, and 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, where appropriate.
- 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 MANAGING THE ENVIRONMENT - THE ROLE OF THE AGENCY

1.1 Who are we?

The Environment Agency has been formed by bringing together the National Rivers Authority (NRA), Her Majesty's Inspectorate of Pollution (HMIP), the Waste Regulation Authorities (WRAs) and some units of the Department of the Environment (DoE) dealing with the technical aspects of waste and contaminated land.

1.2 Our Principal Aim

Our aim as set out in the Environment Act 1995, is to protect or enhance the environment, taken as a whole, in order to play our part in attaining the objective of sustainable development.

1.3 Our Objectives

The Environment Agency works towards Sustainable Development through seven objectives, set by Ministers:

- An integrated approach to environmental protection and enhancement, considering the impact of all activities and natural resources.
- Delivery of environmental goals without imposing excessive costs on industry or society as a whole.
- Clear and effective procedures for serving its customers, including the development of single points of contact with the Agency.
- High professional standards, using the best possible information and analytical methods.
- Organisation of its own activities to reflect good environmental and management practice, and provision of value for money for those who pay its charges, and for taxpayers as a whole.
- Provision of clear and readily available advice and information on its work.
- Development of a close and responsive relationship with the public, including local authorities, other representatives of local communities and regulated organizations.

1.4 What we do

Our work is divided into seven main functions:

Flood Defence has the role of protecting people and the developed environment from flooding by providing effective defences and protection of floodplains. Safeguarding life is our highest priority and to meet this aim we provide a flood forecasting and warning service. Flood Defence also aims to protect and enhance the natural environment by promoting works that are sustainable and work with nature.

The ***Water Resource*** function comprises the conservation, redistribution and augmentation of surface and groundwater supplies. It includes the powers to encourage water conservation and to promote transfer schemes and to balance the needs of water users and the environment by issuing licences for users to abstract water from rivers and boreholes.

The ***Pollution Control*** function includes:

- Integrated Pollution Control (IPC) regulating the most polluting, or technologically complex, industrial and other processes in air, on land or in water.
- Water quality and pollution control which prevents and controls pollution and monitors the quality of rivers, estuaries and coastal waters.
- Radioactive Substances (RAS) regulating the keeping and use of radioactive materials and accumulation of radioactive waste (except on nuclear licensed sites); regulating the disposal of radioactive wastes from all sites.
- Waste Regulation setting consistent standards for waste management practice to regulate the treatment, storage, movement and disposal of controlled waste. The Agency will have a requirement to register and monitor those businesses which manufacture, fill or sell packaging materials, imposing obligations to recover and recycle set tonnages.
- Reporting on the extent of contaminated land and contributing to its management (primarily undertaken by local authorities).
- Abandoned mine operators are also required to work with the Agency so that steps can be taken to prevent mine water pollution in the future.

The Environment Agency is responsible for maintaining, improving and developing ***Fisheries***. This is carried out by licensing, regulation and enforcement schemes which cover salmon, sea trout, non-migratory trout, coarse and eel fisheries. The Agency also carries out improvements to fisheries by improving the habitat, fish stocks and providing advice to fishery owners.

The ***Navigation*** function is responsible for managing and improving over 800 km of inland waterways where the Environment Agency is the Navigation Authority; Rye Harbour and the Dee Estuary. Its aim is to make these resources widely available to the public for water or land based recreational use. The Environment Agency is <u>not</u> a Navigation Authority in the South West Region.

The Agency must also take account of ***Recreation*** and access. Over 1,000 sites in our control are managed for recreational use. We also have a general duty to promote the recreational use of water and land throughout England and Wales.

In fulfilling all its functions the Environment Agency is required to contribute to the ***Conservation*** of nature, landscape and archaeological heritage. We have a <u>regard</u> to conserving and enhancing flora, fauna, geological or physiographical features when carrying out our pollution control functions, and a duty to <u>further</u> conservation when carrying out our other functions. We also have a duty generally to promote the conservation of flora and fauna dependent on the aquatic environment.

1.5 What we do not do

The Environment Agency does not cover all aspects of environmental legislation and service to the general public. Your Local Authority deals with all noise problems; litter; and air pollution arising from vehicles, household areas, small businesses and small industries.

Planning permission is the responsibility of your Local Authority who will contact the Environment Agency when necessary. The local authorities also deal with contaminated land issues in liaison with the Environment Agency.

Environmental Health issues should also be directed to your Local Authority - details can be found in your local telephone directory.

1.6 Who are our customers?

We have a wide range of customers. In the broadest sense, the general public are our customers but some of them pay us directly for specific services which nationally include:

over 2,000 industrial processes, keeping and use of radioactive materials at 8,000 sites disposal of radioactive waste from 1,000 sites; 8,000 waste management sites and some 70,000 waste carriers; 100,000 water discharge consents including 6,000 sewage works, 50,000 licensed water abstractions, 43,000 kms of flood defence works, 1,000,000 angling licences and navigation licences for some 40,000 boats.

Other customers receive services paid for indirectly through Government grants and taxation. These include the public and many businesses and representative groups that form part of our community, such as conservationists and farmers. We also regard government at the local, national and European level as our customers this includes over 500 local authority bodies.

1.7 How we are structured

The Agency has a Board of up to 15 members appointed by the Department of the Environment, the Ministry of Agriculture, Fisheries and Food and the Welsh Office and includes the Agency's Chairman and Chief Executive.

The Agency is split into eight Regions covering England and Wales. Each Region has three statutory Regional Committees covering environmental protection, flood defence and fisheries and includes local authority and business representatives. These meetings are open to the public and the media.

Eight Directors provide overall management of the Agency's work and are based at our Head Office in Bristol with supporting offices in London. Regions are split into three or four Areas making a total of 26. Each Region has a Regional General Manager and each Area has an Area Manager.

1.8 Environmental Standards

Are set in European and UK legislation. The Environment Agency has the responsibility for enforcing some of these standards within England and Wales.

There is a great deal of legislation that has an impact on the way the Environment Agency operates or the way we carry out our enforcement duties. The main legislation includes the following Acts:

- Salmon and Freshwater Fisheries Act 1975.
- Control of Pollution (Amendment) Act 1989.
- Environmental Protection Act 1990.
  Part I (Integrated Pollution Control).
  Part II (Waste).
- Water Resources Act 1991.

- Land Drainage Act 1991.
- Water Industry Act 1991.
- Radioactive Substances Act 1993.
- Deregulation and Contracting Out Act 1994.
- Welsh Language Act 1995.
- Environment Act 1995.
- Wildlife and Countryside Act 1981.

We are also the competent Authority for over 25 European Community environmental directives whilst a further 70 directives affect our policies and activities. For example, these include:

Drinking Water, Nitrate, Habitats and Species, Birds, Dangerous Substances, Industrial Plant Emissions, Waste Management Framework, Packaging and Packing Waste, Quality of Water to Protect Freshwater Fisheries and Urban Waste Water Treatment.

Details of all new legislation, byelaws and statutory instruments affecting the Environment Agency are given in our Annual Report and Accounts.

We also operate non-statutory standards such as our informal river quality objectives that are aimed at particular stretches of river and estuary, you will find details about these in this plan.

1.9 Operational Standards

Operational Standards cover our technical, scientific and engineering procedures which are necessary to put European and UK legislation and Environment Agency policy into practice.

These standards take many forms, including policy statements, procedural manuals and a suite of quantitative output and performance measures that we monitor quarterly and some annually. Details of our operational standards are published in technical handbooks, research and development reports and information leaflets. Further details are available from the contact given at the front of this plan.

1.10 Internal Environmental Policy

We operate our own internal environmental policy. This includes recycling, waste minimisation and energy efficiency schemes covering all of our activities across England and Wales.

We aim to ensure that our own actions do not cause damage to the environment and that the resources we use are managed in a sustainable fashion. Our results will be published as part of our Annual Report & Accounts.

1.11 Public Registers and Access to Environmental Information

The Environment Agency maintains several public registers (33 in May 1996) which can be inspected at most Environment Agency offices free of charge. The main public registers cover:

Integrated Pollution Control (IPC) - holding information on industrial processes regulated under the IPC regime. The Chemical Release Inventory (CRI) has information on releases from these processes. The IPC register is also held by local councils for the relevant processes.

Radioactive substances - with information relating to the use, accumulation and disposal of radioactive materials and waste. The register is also held by local councils for the relevant premises.

Water Quality and Pollution Control - containing information on discharge consents, water quality sample results and maps of freshwater limits and controlled coastal waters.

Water Abstraction and Impounding - holding information on water abstraction and impounding licences.

Waste - with Waste Management Licensing information relating to the recovery or disposal of waste and details about carriers and brokers of waste.

In addition the following information also exists:

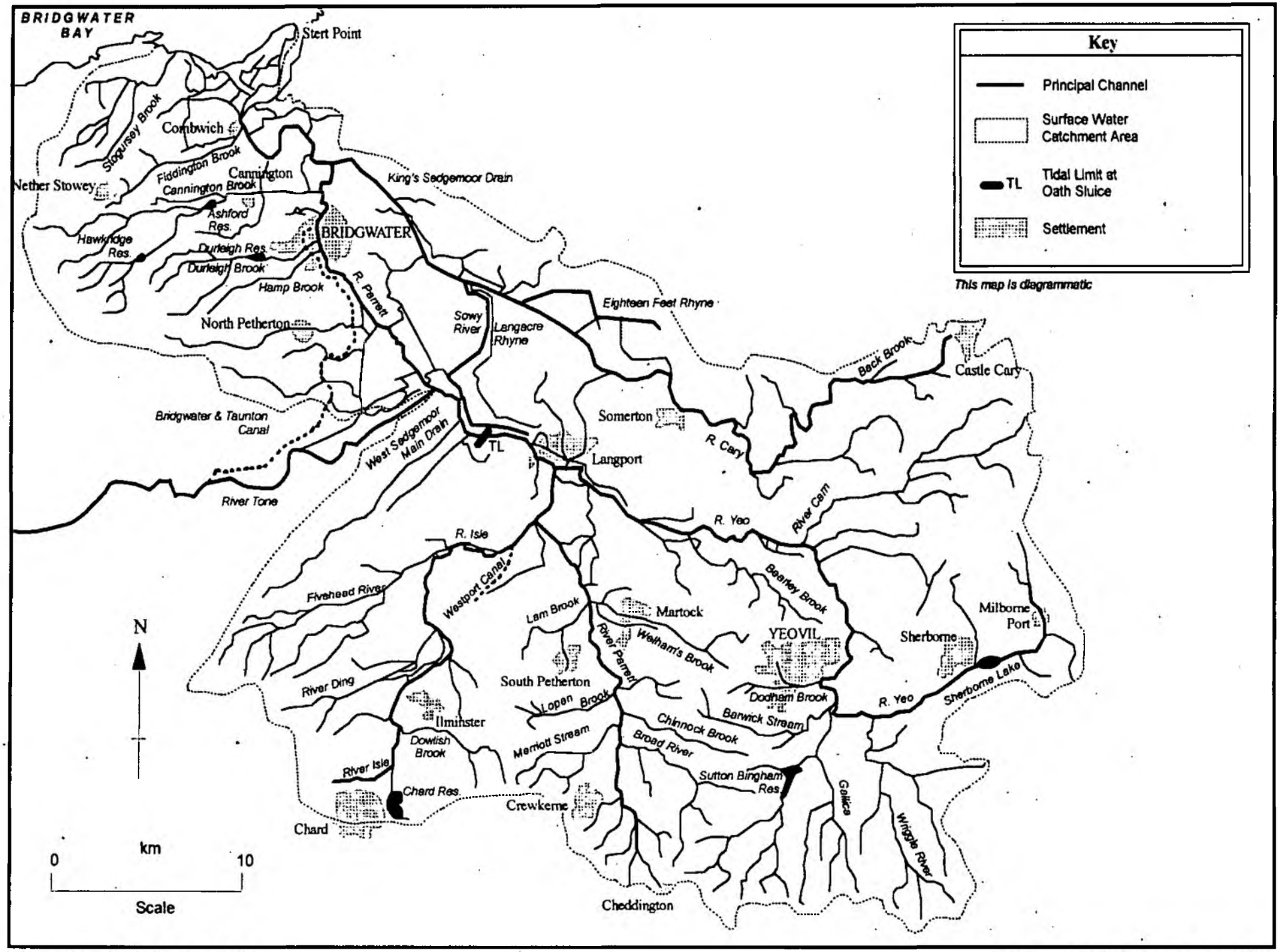
- ***Genetically Modified Organisms (Deliberate Release) Register***. This is produced by the Department of the Environment Biotechnology Unit and is made available through the Environment Agency at most regional offices.

- ***Local Authority Air Pollution Control (LAAPC)*** lists authorizations. Details are available from your local District Council. ***Register of Industrial Works (Air Register)***. These are being incorporated into the Agency's Integrated Pollution Control scheme.

- ***Works Discharge Register*** - with information on premises which abut watercourses.

- ***Special Waste Notifications*** - with consignment notes on the disposal and location of waste.

Map 2 - River Parrett Catchment



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2 THIS LOCAL ENVIRONMENT AGENCY PLAN

2.1 The Consultation Report

This Local Environment Agency Plan Consultation Report gives you the opportunity to comment on environmental problems or the work of the Agency, it:

describes some of the key environmental characteristics of the area;
explains how the environment is affected by human uses or pressures;
outlines issues where the Environment Agency or others need to take action to address problems in the environment and consults on options for those actions.

The Consultation Report includes the following key sections:

Catchment Characteristics (Section 3)

This chapter provides a brief and general introduction to the catchment area.

Issues List (Section 4)

This is a summary. Details are in Section 7.

Protection through Partnership (Section 5)

This section explores some of the areas for actual and potential partnership ventures.

Uses, Activities, Pressures (Section 6)

We place ever more demands on the environment but expect it to be protected from harm. This section looks at the main uses of the area and the pressures that we put on the environment.

Targets, State of the Environment and Issues (Section 7)

In this section we look at different aspects of environmental media such as air, water and land and consider what standards are available to allow us to assess the state of the environment within and between these media. Shortfalls and other environmental problems are described as Issues, and Options for their resolution are proposed for consultation.

This Plan was largely written before the Environment Agency National Guidance was published. As such it is a hybrid document i.e. part way between an NRA Catchment Management Plan and a Local Environment Agency Plan to the new guidance. The sections on Air Quality and Waste will be expanded when the area is re-visited to produce a combined LEAP for the Parrett and Tone in November 1999.

PLEASE USE THE CONTENTS TABLE

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

2.2 The Action Plan

We will collate responses to this Report and publish an Action Plan in August 1997. Each year we will review the progress that has been made with the actions identified in the Action Plan and publish a brief review. We intend to publish a combined Local Environment Agency Plan for the Parrett and Tone Catchments by November 1999.

2.3 Local Environment Agency Plans and Development Plans

While we can control some of the things which 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. However, planning authorities have little control over agriculture or MOD developments.

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 encourage them to adopt policies which protect the environment from harmful development. Where we can we will reinforce these policies when we comment on planning matters or if we are making our own decisions, and work in partnership towards achieving sustainable development. This Report will highlight where we are concerned about development.

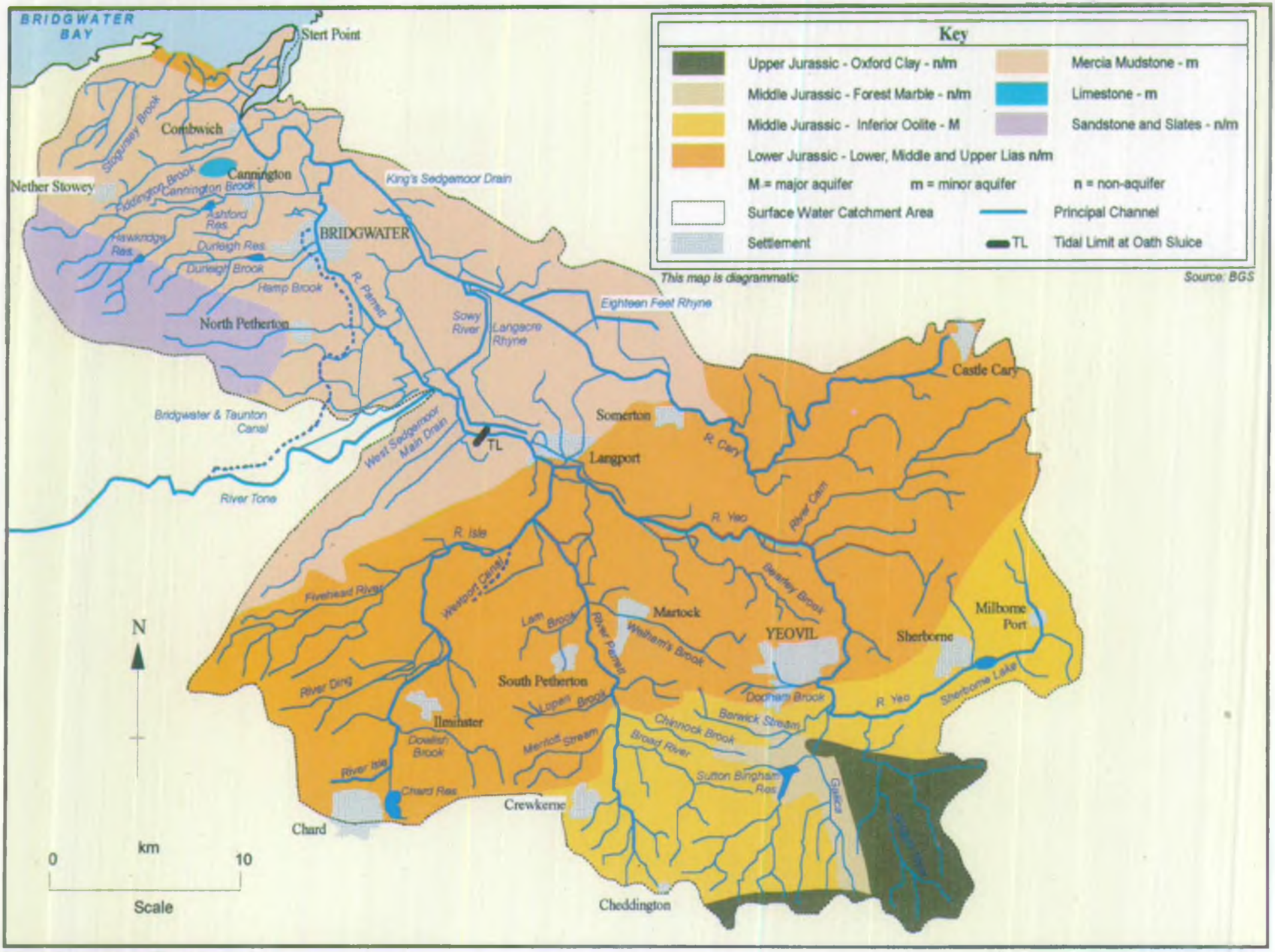
2.4 Local Environment Agency Plans (LEAPs) and Catchment Management Plans

This LEAP slots into a sequence of plans which were being prepared by the NRA to cover all river catchments in England and Wales by the end of 1998. Local Environment Agency Plans will be used by the Agency to cover the same topics as Catchment Management Plans but they will <u>also</u> deal with new topics to cover the full range of the Agency's responsibilities. These are Integrated Pollution Control, Waste Regulation and Radioactive Substances Regulations (see Section 1.4). The Agency aims to have a LEAP consultation for all areas published by 31 December 1999.

<u>LEAP Publication Date Programme</u>

River Brue	-	May 1997
North Somerset Rivers	-	December 1997
West Somerset Rivers	-	February 1998
Bristol Avon	-	June 1998
Parrett and Tone	-	November 1999

Map 3 - Simplified Geology



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3 CATCHMENT CHARACTERISTICS

3.1 Catchment Description

The River Parrett Catchment covers an area of approximately 1251 km^2 and has its source near Cheddington to the south of Crewkerne. From its origin to Stert Point, Bridgwater where it enters the Severn Estuary it is about 59 km long and falls 160 m to sea level. The River Parrett flows north, passing Martock, and is joined by the River Isle and River Yeo to the south of Langport becoming tidal at Oath Sluice. The Parrett has an exceptionally long tidal reach. Much of the surrounding land is below high spring tide level. The flood tide carries large quantities of silt up the tidal reaches from the Severn Estuary which causes major problems for channel management and wildlife.

The River Tone is a major tributary which joins the tidal Parrett at Burrowbridge. The is the subject of a Catchment Management Plan published in September 1995. The River Cary rises at Castle Cary and travels in a westerly direction entering the King's Sedgemoor Drain at Henley Corner, which continues across the Somerset Moors joining the tidal River Parrett downstream of Bridgwater at Dunball Sluice. There are further contributions below the tidal limit from a number of streams which have their headwaters on the east side of the Quantock Hills.

The middle and lower reaches of the Parrett and its tributaries have a very low gradient and so is not very effective in draining the Somerset Levels and Moors.

The Bridgwater and Taunton Canal leaves the Tone at Firepool Lock in Taunton. At Hamp in Bridgwater, a weir was constructed under the British Rail Act 1969 which authorised the closure of Bridgwater Docks to enable surplus water to run into the tidal River Parrett. The canal ends at Bridgwater Docks, where a sluice is provided to allow a 'land drainage bleed' to discharge into the River Parrett.

3.2 Geology, Soil and Land Use

Within the catchment, the rocks are, in general, oldest in the northwest and get progressively younger to the southeast. The predominantly soft nature of the Triassic and Liassic rocks (marls, sandstones and mudstones) gives rise to the areas of low relief whereas the low hills that run past Castle Cary to near Yeovil are the result of the crowning of harder Middle Jurassic Inferior Oolitic Limestone. Between Yeovil and Crewkerne, the Middle Jurassic Forest Marble Limestone forms a NW/SE trending ridge, reaching a height of 182 m AOD. Of local importance for their water bearing properties are the Upper Liassic Yeovil Sands. This formation of yellow micaceous sands locally containing bands of sandstone has an arc shaped outcrop curving through Dinnington and Hinton St. George, eastward through Chiselborough and Yeovil, and then sweeping northeast through Corton Denham and beyond. The strata form a long scarp, broken by steep-sided valleys. The scenery of this sandy belt is highly characteristic, with grassy slopes or vertical cliffs.

The southern part of the catchment at the Somerset/Dorset border is characterised by Jurassic limestone ridges, overlain by slowly permeable calcareous clayey soils associated with shallow, well-drained brashy calcareous soils and calcareous clayey soils. This same geology/soil combination is found along the Polden Hills and the Fivehead Ridge,

together with the linking hills from Long Sutton to Castle Cary. These soils are suited to short-term grassland and winter cereals, as well as permanent grassland.

In the Dorset part of the catchment the soils are slowly permeable, seasonally waterlogged clayey/fine loamy soils over clay, on which natural drainage is badly impeded. The same geology/soil complex is found east of Crewkerne, south of Ilminster and on the edge of the Blackdown Hills. These soils are mainly suited to permanent grassland, with some winter cereals in drier lowlands.

The more fertile plain at the foot of the limestone ridges, stretching from Ilminster to Yeovil and northwards to Castle Cary, is characterised by deep well-drained silty soils over siltstone and sandstone, associated with fine silty loams over clay. This area being suited to cereals, potatoes, field vegetables and horticulture, together with short-term grassland. A similar pattern is true of the Quantock foothills south and west of Bridgwater, where well-drained reddish fine loamy/silty soils over mudstone and slate predominate.

The Moors are areas of deep peat soils with earthy topsoil (West Sedgemoor, King's Sedgemoor, North Moor) associated with other parts of clayey soils overlying peat or river alluvium (Wet Moor, West Moor, Aller Moor). These low-lying areas are subject to flood risk, with soils seasonally affected by groundwater, making them most suited to permanent grassland, albeit with some cereals where flood risk is low.

3.3 Hydrology

3.3.1 *Hydrogeology*

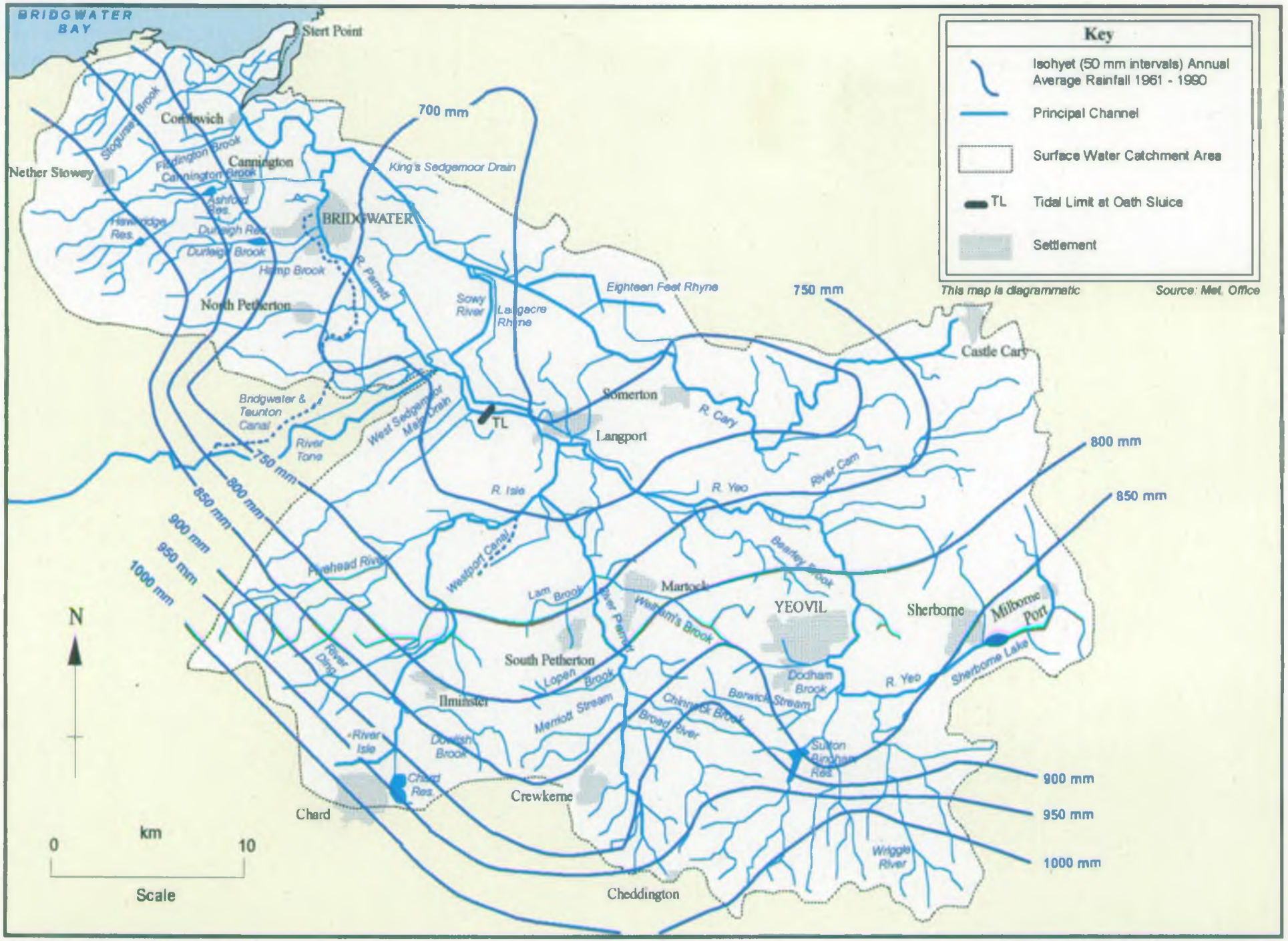
The only major aquifer unit within the catchment is the Inferior Oolite. In addition to transmitting its own recharge, the Oolite collects and transmits water by fracture/intergranular flow from the underlying sands. The Forest Marble, Devonian (Otter) Sandstone and Lower Lias are all classified by the Environment Agency as minor aquifers which may have importance for local supplies. Although the Upper Liassic Yeovil Sands have also been classified as minor aquifers, in the Crewkerne area the rocks are able to store sufficient water to support public water supply abstraction. The Oxford Clay and Middle Lias are mainly non-aquifers.

For information regarding how the aquifers relate to river flows within the catchment, please refer to Section 3.3.3.

3.3.2 *Rainfall*

The distribution of rainfall over the catchment is shown on the map opposite. The range varies from more than 1000 millimetres per year (mm/year) in the south of the catchment to less than 700 mm/year over the Somerset Moors. The catchment rainfall (1961-90 average) is estimated at 774.4 mm/year.

Map 4 - Distribution of Rainfall



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3.3.3 *River Flow*

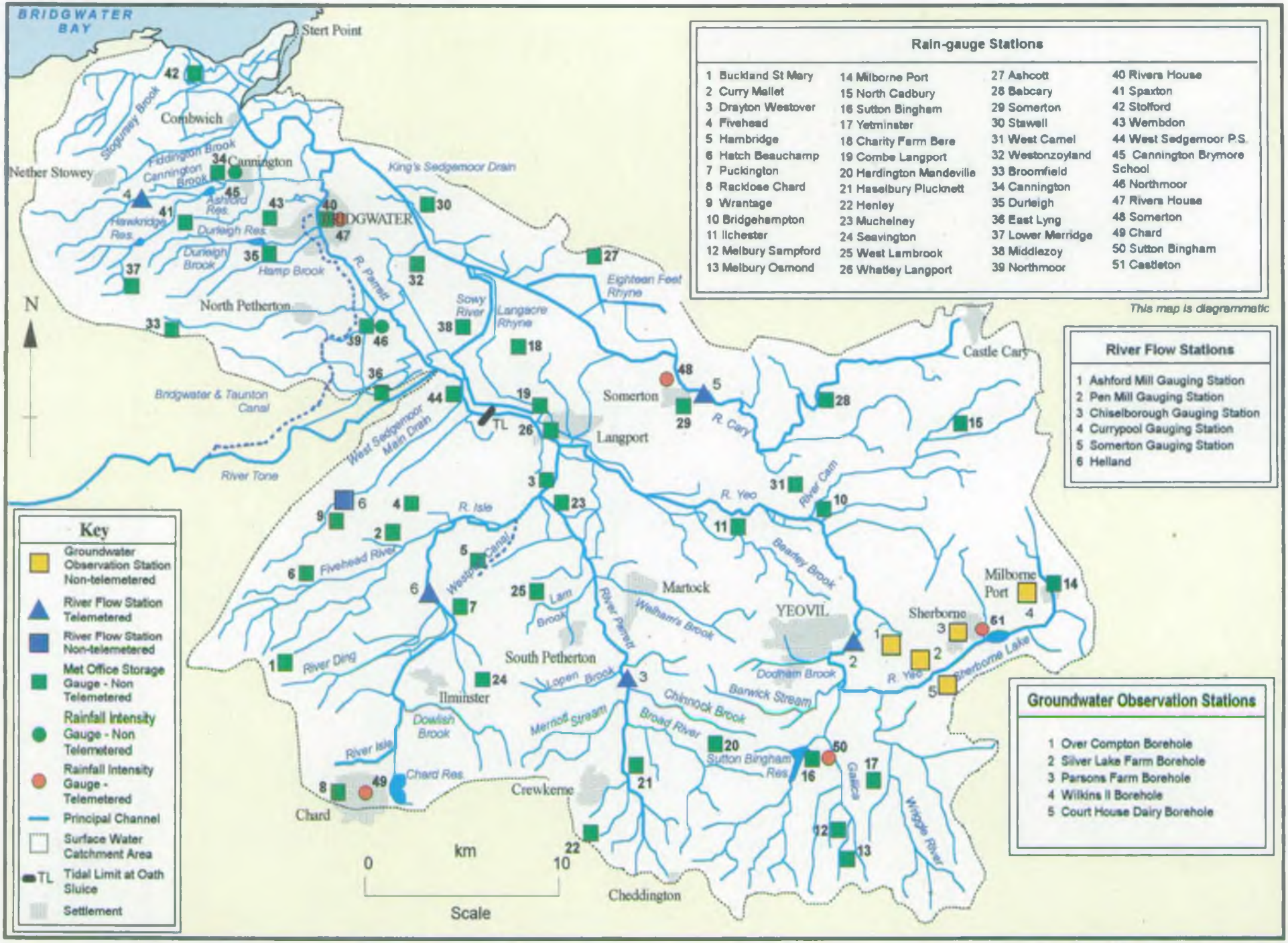
Discounting human influences the natural flow of water leaving the catchment is estimated at 1513 million litres per day (Ml/d) on average. (Estimated discharge of water leaving the catchment is derived from the 'Micro Low Flows' package developed by the Institute of Hydrology). The major inputs above the tidal limit are the River Isle and its tributaries (180 Ml/d) and the River Yeo and its tributaries (352 Ml/d). Below the tidal limit the major tributaries are the Tone (477 Ml/d) and the Cary/King's Sedgemoor Drain (76 Ml/d). There are further smaller contributions below the tidal limit from the Durleigh Brook (20 Ml/d), the Cannington Brook (48 Ml/d) and the Fiddington Brook (16 Ml/d).

The relative impermeability and the density of the channel network at the top of the Upper Parrett, Isle and Yeo catchments mean that tributaries respond rapidly to rainfall events. Also, baseflows are relatively small and in dry weather river flows can reduce rapidly. The River Yeo is regulated to a minor degree by Sutton Bingham Reservoir and Sherborne Lake. Sutton Bingham releases a compensation flow which helps to maintain low flows during dry periods.

In the lower catchment on the Somerset Moors flood waters are alleviated by a relief channel from the River Parrett downstream of Oath Sluice which cuts across the Moors to the King's Sedgemoor Drain.

The water resources of the Parrett Catchment are monitored using a network of 5 flow gauges, 7 intensity and 44 storage rain-gauges, and 5 groundwater observation sites. Map 5 - Hydrometric Network, shows details of the monitoring network. Data from the network is stored mainly on computer systems at the Environment Agency Office, North Wessex Area at Bridgwater, Somerset.

Map 5 - Hydrometric Network



Rain-gauge Stations

1 Buckland St Mary	14 Milborne Port	27 Ashcott	40 Rivers House
2 Curry Mallet	15 North Cadbury	28 Babcary	41 Spaxton
3 Drayton Westover	16 Sutton Bingham	29 Somerton	42 Stolford
4 Fivehead	17 Yetminster	30 Stawell	43 Wembdon
5 Hambridge	18 Charity Farm Bere	31 West Camel	44 West Sedgemoor P.S.
6 Hatch Beauchamp	19 Combe Langport	32 Westonzoyland	45 Cannington Brymore School
7 Puckington	20 Hardington Mandeville	33 Broomfield	46 Northmoor
8 Racklose Chard	21 Haselbury Plucknett	34 Cannington	47 Rivers House
9 Wrantage	22 Henley	35 Durleigh	48 Somerton
10 Bridgehampton	23 Muchelney	36 East Lyng	49 Chard
11 Ilchester	24 Seavington	37 Lower Merridge	50 Sutton Bingham
12 Melbury Sampford	25 West Lambrook	38 Middlezoy	51 Castleton
13 Melbury Osmond	26 Whatley Langport	39 Northmoor	

This map is diagrammatic

River Flow Stations

1 Ashford Mill Gauging Station
2 Pen Mill Gauging Station
3 Chiselborough Gauging Station
4 Currypool Gauging Station
5 Somerton Gauging Station
6 Helland

Key

- Groundwater Observation Station Non-telemetered
- River Flow Station Telemetered
- River Flow Station Non-telemetered
- Met Office Storage Gauge - Non Telemetered
- Rainfall Intensity Gauge - Non Telemetered
- Rainfall Intensity Gauge - Telemetered
- Principal Channel
- Surface Water Catchment Area
- TL Tidal Limit at Oath Sluice
- Settlement

Groundwater Observation Stations

1 Over Compton Borehole
2 Silver Lake Farm Borehole
3 Parsons Farm Borehole
4 Wilkins II Borehole
5 Court House Dairy Borehole

Information correct as of December 1996

4 ISSUES LIST

This list is a summary of the issues with page numbers for quick reference. For a full discussion of the issues and options for action, please refer to Section 7.

5.0 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 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.

Links with Local Authorities

Development

We advise local planning authorities on the impact of proposed development together with our requirements for environmental protection (See Section 6.5 - The Built Environment and Development Plans). 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.

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.

Amenity and Recreation Initiatives

We work on local authority led recreation initiatives - a good example is the River Parrett Trail which brought together various bodies to develop the long distance footpath. There is considerable scope for further similar 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.

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.

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.

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.

Working with Business

We are working in partnership with local businesses to promote pollution prevention and waste minimisation. 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.

Links with Government Bodies

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.

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. This LEAP is a practical example of the material we publish which can assist in raising public awareness and understanding of environmental issues.

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, Angling Associations, British Waterways, Industry, Waste Management Companies, Wildlife Trusts and Recreation representative(s).

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

One-off Partnerships

In the Parrett Catchment one good example of a one-off partnership is the creation of Cocklemoor, Langport as a public open space, including tree planting. This was carried out with the parish council using Agency-owned land.

6.1 LANDSCAPE, WILDLIFE AND ARCHAEOLOGY

Here we consider how we protect and manage the natural environment and the historic built environment associated with rivers and wetlands.

Our Objectives

To ensure that these features are not degraded through neglect, mismanagement, or insensitive development and wherever we can, take measures to enhance them.

The Role of the Environment Agency

We promote the conservation of landscape, wildlife and archaeology through our work to safeguard water quality, manage water resources and provide flood defences. An important part of our work is to influence land use planners and land managers to look after rivers and wetlands sensitively.

We have duties to:

- conserve and enhance landscape, wildlife and natural features especially in rivers and wetlands;
- protect and conserve buildings, sites and objects of archaeological, architectural or historic interest in the course of our other work.

Our work involves a range of activities:

- Studying river and wetland wildlife. We are developing better methods for doing this.
- Developing standard ways of reviewing the effects of our work on wildlife.
- Establishing a national database to store wildlife information.
- Improving the way we consider and carry out Environmental Assessments.
- Encouraging local planning authorities and developers to promote wildlife conservation on rivers and wetlands, and encouraging the development of new river management techniques.
- Seeking to minimize the environmental impact of any proposed work to rivers.

Local Perspective

The catchment of the River Parrett is probably the most complex network of interconnected semi-natural and man-made watercourses in Somerset. The catchment is bounded to the north by the ridge of the Polden Hills, and incorporates small streams running from the steep scarp slopes of the Quantocks and Blackdown Hills, joining to flow through the lowlands of the Somerset Levels and Moors to discharge via the tidal Parrett into the Severn Estuary. The complex geology and landform of the catchment gives rise to an exceptional range of landscape and river types from short steep streams on the Quantock Hills to the sluggish nutrient-rich water in the lowland Moors.

Landscape

Much of the Parrett Catchment is designated as a valued landscape by both national and county designations. These landscapes are protected to some extent by planning policies which aim to prevent damaging developments, but cannot control land use changes. In the recent past (i.e. over the last 50-100 years) the principal changes have been a loss of tree and shrub cover, the engineering of lowland river sections involving straightening and the construction of substantial flood embankments, and the conversion of permanent pasture land to arable cultivation. These changes have had a profound influence on the landscape and wildlife of the river and its catchment.

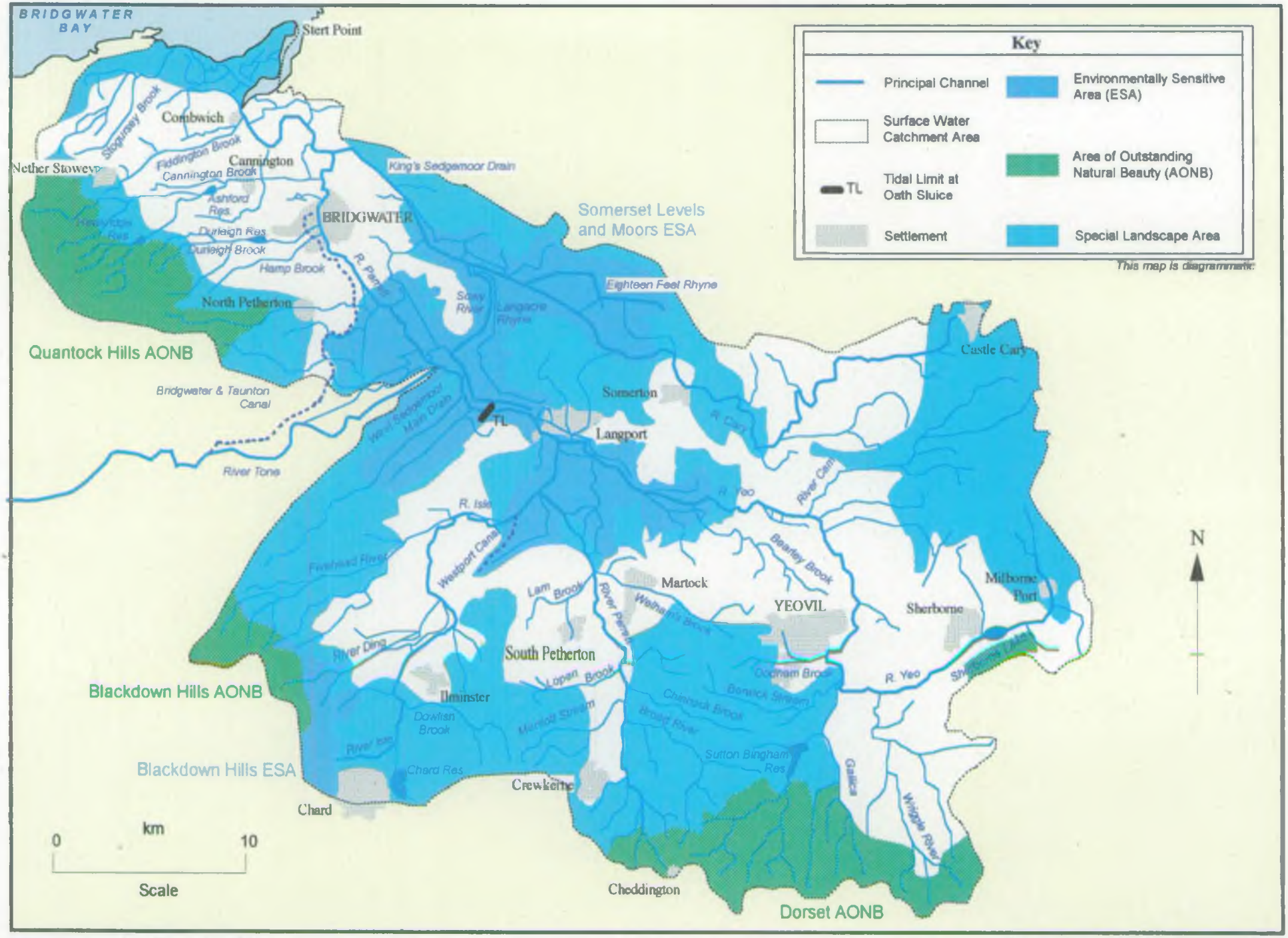
The landscape character of the catchment is heavily influenced both by the complex and distinctive geology and the activities of man. The dominant feature is the low lying moorland landscape, with its rectilinear pattern of man-made drainage channels, pollarded willows and scattered tree and shrub cover; expansive, open and relatively remote but essentially a controlled wetland. The Ministry of Agriculture, Fisheries and Food (MAFF) Environmentally Sensitive Area Landscape Assessment states that "this evasive balance between wet and dry, nature and human influence ... makes the Moors an exceptional landscape of national significance". To the north, the area around Bridgwater Bay exhibits similar characteristics, with straight reed-filled ditches draining the open landscape of improved pasture and arable fields. The coast is open and low lying, with shingle ridges providing significant features. The Quantock edge landscape with its steep-sided valleys supports a more intimate mosaic of oak woodlands and scrub, heathland and conifer plantations, the smaller fields divided by hedgerows with mature trees.

The Fivehead Vale is characterised by a gently undulating landscape with most fields managed as permanent pasture and enclosed by hedgerows. To the south of the catchment the steep scarp slopes of the Blackdown and Dorset Hills are more heavily wooded, with deeply incised river valleys and many interconnecting hedgerows. By the middle reaches the topography is more gently undulating and the landscape more open and dominated by intensive agriculture, with much arable cultivation.

Some of the future landscape changes which may be anticipated could be beneficial, particularly within that part of the catchment which is an Environmentally Sensitive Area (ESA). Designated by MAFF in 1987, the overall aim of the Somerset Levels and Moors ESA is to "conserve and enhance the natural beauty of the area". Specific objectives include the conservation of wet grassland areas and their associated landscape features particularly ditches, rhynes and pollarded willows. A landscape assessment was prepared to enable the monitoring of changes over time. (See Publications Appendix 1 - Somerset Levels & Moors - Landscape Assessment for Monitoring, MAFF July 1990). The report identifies a number of landscape types including open moor (the predominant type within the Parrett Catchment), semi-open moor, domesticated moor and hillocks (see Map 6 - Landscape).

Other potential changes are likely to be mainly associated with built developments, principally around Bridgwater and Yeovil, and road schemes. South Somerset District Council have produced (1993) a Landscape Assessment which is of considerable help in the work towards prioritizing landscape enhancement and landscape conservation. Taunton Deane Borough Council have prepared the Deane Tree Plan, which highlights landscape

Map 6 - Landscape



Information correct as of December 1996

character areas within the Borough and overlaps with the Parrett Catchment. This includes the Levels and Moors landscape, river floodplain, limestone scarp and Fivehead Vale. The Taunton Vale and Quantock landscapes are particularly important, and greatly valued for amenity use due to particularly good networks of public rights of way.

English Nature and the Countryside Commission are compiling maps and descriptions of Natural Areas/Countryside Character which will include the Parrett Catchment. This information will help the Agency to prioritize its actions. Somerset County Council designated Special Landscape Areas and nationally designated Areas of Outstanding Natural Beauty are shown on Map 6 - Landscape.

Wildlife

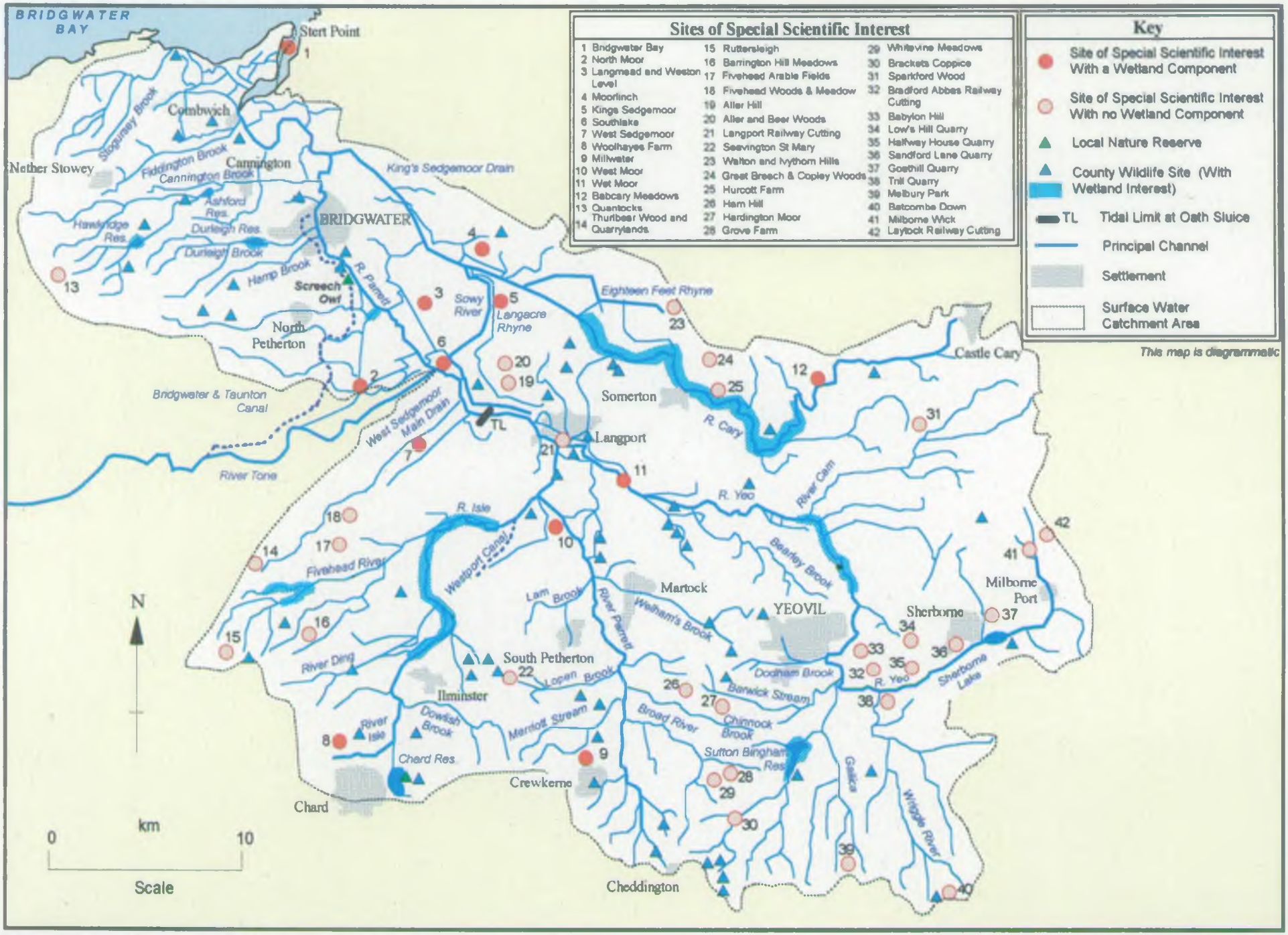
Of over-riding importance in this catchment is the lowland wet grassland resource of the Somerset Levels and Moors, the largest remaining area of this habitat in Britain. Map 7 - Wildlife Sites - shows the Sites of Special Scientific Interest (SSSIs) together with locally designated nature conservation areas. Seven of the wetland SSSIs are to be designated as a Special Protection Area (SPA)/RAMSAR site of international importance, (see Glossary Appendix 2) for which consultation has taken place. The lowest reach of the Parrett is already a SPA and RAMSAR area and is a proposed Special Area of Conservation (PSAC) under the EC Habitats Directive (see Appendix 1, No.31). The Severn Estuary is also a proposed SAC. They are of international importance for the numbers of waterfowl which are regularly present during winter, for the wetland plants and animals of the rhyne system; and for the wet grassland habitat which makes the area one of the most important lowland sites in Southern Britain for breeding waders. Somerset is also a particularly important stronghold for unimproved grassland rich in plant and invertebrate species.

Much of the moorland is only a few metres above mean sea level, and receives runoff from a relatively large upland catchment. The low gradient of the arterial watercourses and the exceptional tidal range of the Severn Estuary (the second highest in the world) make the area extremely flood prone. The evacuation of flood water is achieved by 11 pumping stations, currently owned and operated by the Environment Agency, and intensively managed main rivers. The upkeep of this system is both labour and capital intensive (see Section 7.3). The management of water level regimes and good water quality (see Section 7.1) are crucial factors in the maintenance of the wetland wildlife.

The lower reaches of the Rivers Isle, Yeo, Cary and non-tidal Parrett are very slow flowing, embanked, effectively impounded, and prone to siltation. The rivers are penned up in summer to raise water levels in the moors for the purposes of irrigation and wet fencing for stock control. These factors, combined with increasingly nutrient rich water and an almost total lack of shade lead to the abundant growth of aquatic plants, particularly during the summer months.

The upper reaches of the Isle, Parrett and Yeo are in direct contrast, being generally sinuous and fast flowing, with well-developed pool and riffle sequences over a stony substrate and almost continuous tree and shrub cover. The small tributaries flowing from the Quantock edge are similar in character. The middle reaches are semi-natural and retain their meandering course, with more scattered tree and shrub cover and numerous impoundments resulting from past use as a source of industrial power for milling.

Map 7 -Wildlife Sites



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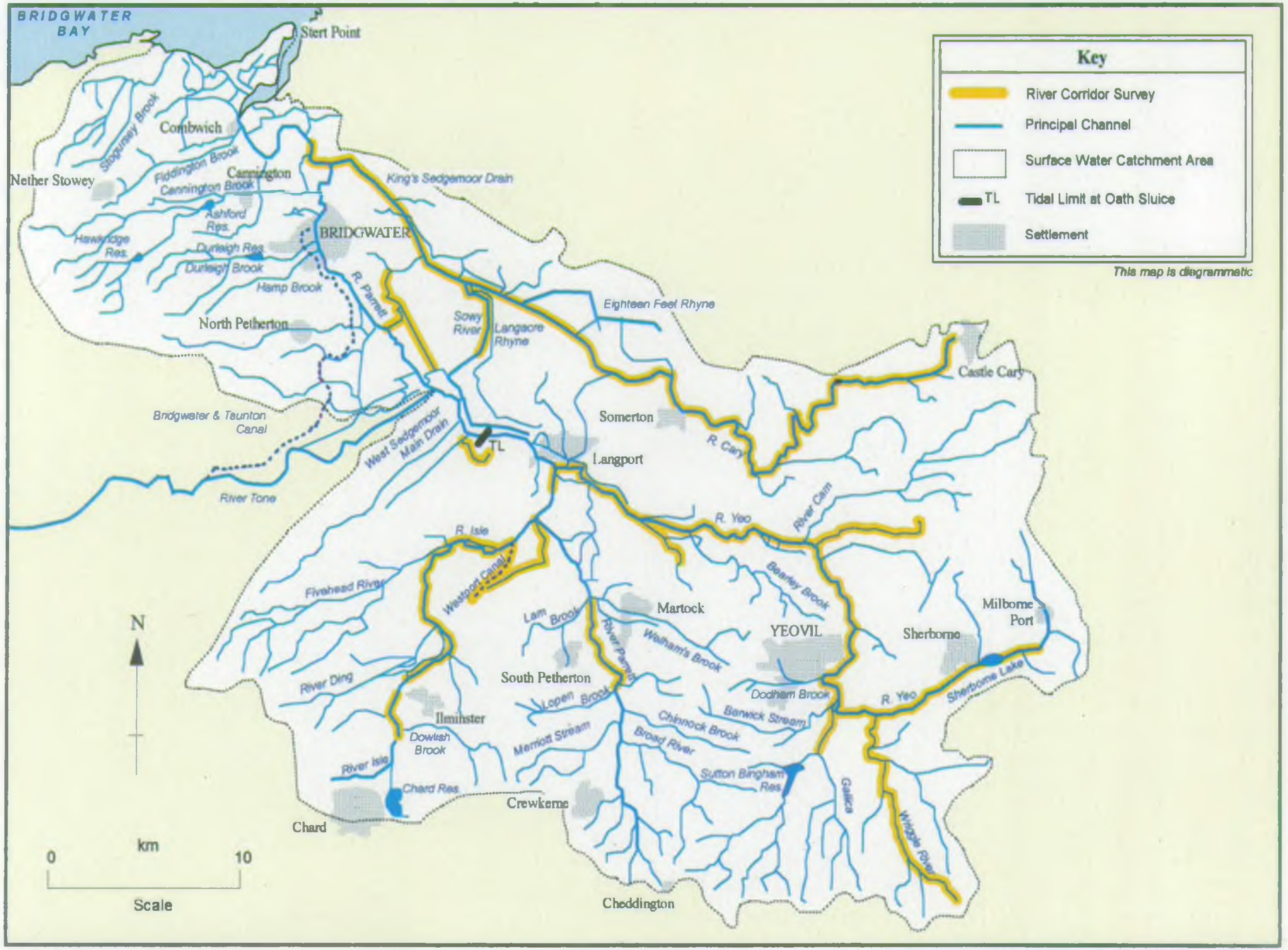
Map 8 - River Corridor Surveys



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The principal threats and problems to the wildlife of the river systems are declining water quality, the over-riding impact of the water level, the intensive maintenance regimes, and field drainage which enables arable cultivation and more intensive agriculture.

Environment Agency Survey and Monitoring Work

Map 8 - River Corridor Surveys, indicates the extent of river corridor surveys within the catchment. River corridor surveys (RCS) are available for the majority of the main rivers, and River Habitat surveys (RHS) have been undertaken as a sampling exercise on a few. Non-main rivers have been assessed using 1994 aerial photographs. Using this information, applications for land drainage consents, abstraction licences, discharge consents and planning permission are screened for their implications for conservation and recreation to ensure that proposed works do not result in environmental degradation. Where possible, positive enhancements and habitat creation are incorporated into designs.

Designated Areas

The number of relatively large wetland sites of international, national and county importance indicates the very high significance of this catchment for wetland wildlife. (See Map 7 - Wildlife Sites). Conservation issues are therefore of great importance within the context of this plan.

Seven SSSIs are considered to be wetlands of international importance (proposed SPA/RAMSAR sites): Bridgwater Bay, Moorlinch, King's Sedgemoor, Southlake, West Sedgemoor, Wet Moor, West Moor.

The Royal Society for the Protection of Birds (RSPB) owns a large part of West Sedgemoor, which holds the largest area of unimproved flood meadows in the country. There is one Local Nature Reserve (LNR) at Screech Owl near Bridgwater. Bridgwater Bay National Nature Reserve (NNR) lies to the north of the catchment, incorporating part of the Parrett Estuary. The majority of the Somerset Levels and Moors area has been designated as an ESA by MAFF, reflecting its national importance for nature conservation and landscape. The Somerset Levels NNR includes land at Southlake, Moorlinch and King's Sedgemoor.

Several of the rivers within the catchment are considered to be of local importance and have been designated as County Wildlife Sites.

Rare Species

<u>Wetlands</u>

The species for which the wetlands of the catchment are considered to be of international importance include wintering birds, notably Bewick's swan, golden plover, teal and lapwing. Of national importance are the numbers of gadwall, shoveler and widgeon. The lowland grasslands also comprise a large proportion of one of the most important sites in southern Britain for those wading birds which breed in damp pastures, particularly lapwing, curlew, redshank and snipe. Yellow wagtail are also found. Whimbrel also use the moist grasslands for feeding whilst on their spring migration.

Rare invertebrates are abundant in the rhyne systems and damp grasslands of the Somerset Levels and Moors, and include several species of Red Data Book (RDB) invertebrates such as the great silver diving beetle. Twenty-four species of dragonfly have been recorded from the SSSIs including the hairy dragonfly and variable damselfly.

Rare plant species found in the rhynes include frogbit, rootless duckweed, least duckweed, hair-like pondweed, flat-stalked pondweed, water violet, fan-leaved water crowfoot, lesser water crowfoot and whorled water milfoil.

Many of the rare plant and invertebrate species found in the catchment are dependent on wetland conditions and continued traditional agricultural management.

Rivers

There are several rare and uncommon plants and animals associated with the rivers of the catchment. Of prime importance is the otter. Under the Environment Agency Otter Strategy, this catchment is recognised as a stronghold where the objectives are to ensure current management practices maintain suitable conditions, and to carry out low-level monitoring of distribution. Under Fishery Byelaw 7E (1992) otter guards of specific dimensions must be used on all fyke nets. These guards are issued by the Environment Agency along with licences to net eels.

Brook lamprey is another uncommon species found in the headwater streams (such as the River Wriggle), which are probably also the stronghold of the water vole and water shrew, now extremely scarce in the Parrett Catchment as a whole due to a number of factors. Recent work by Somerset Wildlife Trust (SWT) and Somerset Environmental Records Centre (SERC) has shown these mammals to be extremely scarce, and possibly retreating to catchment headwaters to escape predation by mink.

Hairy click beetles (a RDB species) have been recorded along a short length of the tidal Parrett and their habitat preference is for stands of reed canary grass on deep mud adjacent to the river. This is the only known site for this beetle in Britain.

Of the notable river plants, flowering rush is present in abundance as are the scarce flat-stalked, perfoliate and hair-like pondweeds, greater pond sedge, pink water speedwell, and sea clubrush. Lanceolate-leaved water plantain is another uncommon plant species associated with the rivers and rhynes of the area, whilst the Cary and Parrett support river water dropwort (Oenanthe fluviatilis) and greater water parsnip (Sium latifolium).

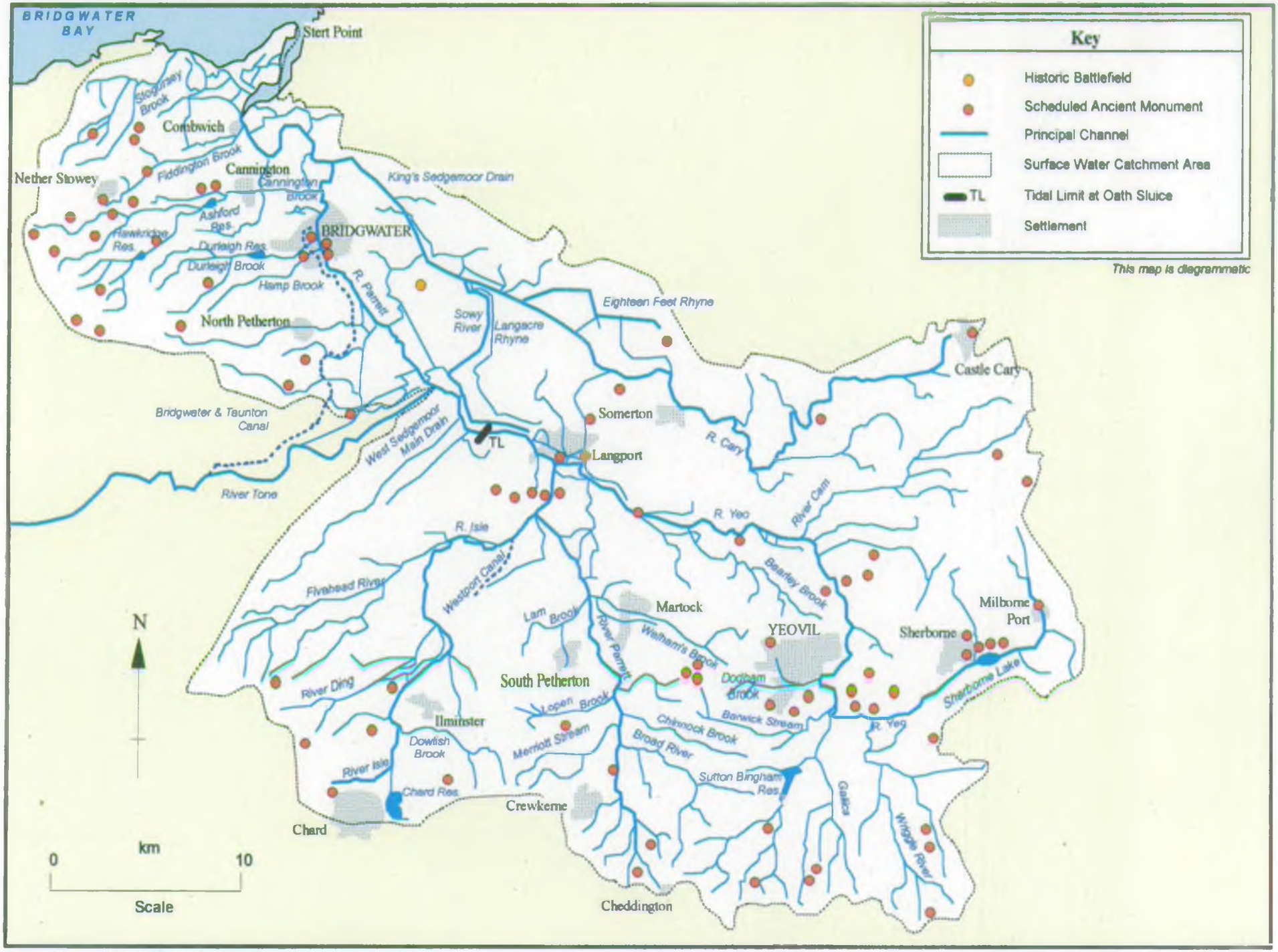
Sweet flag (Acorus calamus) has been recorded from the margins of Sherborne Lake, where it may have been planted.

Biodiversity

The biodiversity of the catchment hinges as much on the sympathetic management of all the watercourses, wetlands and County Wildlife Sites as on the maintenance, enhancement and wise use of those sites designated as wetlands of international importance.

Some species listed within the EC Habitats Directive occur within the catchment, including the otter.

Map 9 - Archaeology



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Biodiversity targets have not yet been set for the SSSIs, nor the catchment as a whole. The conservation, extension and management of species-rich floodplain grasslands will be a key issue in this catchment, as will the implementation of our Somerset Levels & Moors Water Level Management and Nature Conservation Strategy.

The UK Biodiversity Action Plan lists key habitats and species which are prioritized for conservation action. The Regional Biodiversity Audit Plan for the South West Region was published at the end of April 1996, and Action Plans are currently being developed for priority habits and species. We will work closely with other organizations principally English Nature (EN), RSPB and SWT, to establish pragmatic and achievable biodiversity targets for the catchment.

Invasive/Alien Species

Himalayan balsam is widespread within the catchment, and giant hogweed has been recorded from one location at Ashford Mills on the River Isle. Hemlock water dropwort is also common on several rivers, thriving in the disturbed bankside areas following dredging. The tubers are poisonous to stock if eaten in quantity.

There has been a sighting of a terrapin on the River Yeo catchment. Concerns have been expressed that this alien species may upset the natural balance within watercourses. Mink are widespread throughout the catchment. There are reports of green frogs in the catchment which could be a threat to the invertebrate population.

Archaeology

The catchment contains a wealth of archaeological remains covering several thousand years of human history. A small proportion of this resource is protected as Scheduled Ancient Monuments (see Map 9 - Archaeology) but a great amount still remains to be discovered, especially where it is buried under deep deposits of clay or peat.

Traces of early hunter-gatherer communities in the area are evidenced by small assemblages of flint tools, notably from Chedzoy and Middlezoy which were then islands surrounded by water. The advent of farming in the Neolithic period is also sparsely represented with a significant collection of axes and arrowheads from Ham Hill constituting the major evidence. However, the discovery of a wooden Neolithic trackway at the edge of Chedzoy Island suggests that the dry islands continued to be the focus of human activity.

In the Bronze Age some pottery from Ilchester suggests a settlement, but isolated finds and hoards of metalwork constitute the majority of evidence from this period. These finds include plastaves, socketed axes, knives, spear-heads, chisels and gouges and are concentrated in the river valleys; evidence of a thriving local metalworking industry. Brushwood trackways joining areas of higher ground are known from Greylake and Henley Bridge, and activity in the wetlands is also evidenced by worked wood from Combe near Langport.

Evidence for Iron Age settlements occurs at the hillforts at Cannington and Ham Hill, and isolated finds of metalwork and coins which occur infrequently over most of the area. Little is known concerning activities lower down in the river valleys. A wealth of Roman archaeology is known from the catchment, especially at Ilchester which was the site of

several forts and the major Roman town of *Lindinis*. The town lay on an important road junction and also had two quays for river transport which still preserve a wealth of waterlogged archaeological deposits. Ilchester's importance is reflected in the large number of small settlements that are known in the surrounding area, in addition to the small town at Westland near Yeovil and the villas at Pitney, Ilchester Mead, Catsgore and Low Ham. Important Roman ports are also known from Combwich and Crandon Bridge, where waterlogged riverside structures may still be preserved.

In the post-Roman period large cemeteries are known from Combwich and Ham Hill. Anglo-Saxon defended *burghs* existed at Langport and Ilchester, both of which probably had important riverside trading areas. Crewkerne and South Petherton were both market centres, and a monastic establishment was created at Muchelney. Domesday book evidence shows that smaller settlements were concentrated on the coastal clay belt and the upland areas.

Later in the Medieval period Somerton, Montacute and Castle Cary all developed into boroughs; while Ilchester, Langport and especially Bridgwater became major river ports. At these last three locations the remains of bridges, wharfs, quays and vessels may all survive. Other waterlogged archaeological deposits may exist in the fish ponds at Muchelney Abbey and Montacute priory, and in the moated sites at Petherton Park, Donyatt, Martock, Merryfield and numerous other places in the area to the west of Bridgwater. Many of these moated sites, such as Cudworth, also contained fish ponds and water mills. Numerous deserted medieval settlements such as Horsey and Nether Abder occur in the area concentrated around the mouth of the Parrett and in the Yeo valley.

On the low lying moors piecemeal land reclamation occurred in the eleventh and twelfth centuries. In the thirteenth century, the Cary and the Parrett were partially canalised and floodbanks associated with land reclamation were built at Burrow Wall, Southlake Wall, Beer Wall, Greylake Fosse, Lake Wall and along the Parrett between Burrow Bridge and Langport. Between 1400 and 1600 further large scale reclamation occurred alongside the rivers upstream of Langport; and near the mouth of the Parrett 'warths' were created to win new land from the estuary. In the land behind these new warths the earlier medieval sea defences survive as relic banks and ditches.

The rivers in the area all had important medieval fisheries on them mainly in the form of artificial weirs or 'gurgites' which often caused problems in times of flood. Six weirs were known to have existed between Sowy and Langport. In addition to fisheries the existing and relict river channels in the area could preserve evidence of mills, bridges, revetments, small rural landing places and the river craft themselves. Such remains, in addition to the Roman and medieval ports and the deeply buried prehistoric evidence, constitute the most important part of the archaeological resource in the catchment area and can all be adversely affected by activities which lead to desiccation of the waterlogged deposits.

Bridges and mills on the Yeo are important archaeological features. The river used to be tidal to this point and was widely used by boat traffic. The pack horse track from Little Load to the Roman town of Ilchester is still evident; Load Bridge and Pill Bridge are important medieval multi-arched bridges. Other bridges of interest include those on the River Cam which date from around the 1630s, and Elm Bridge and Bickenhall on the Fivehead River. Many of the old bridges associated with the rivers were removed during canalization and embankment works. The many mills are important industrial

archaeological relics, particularly the Parrett works at Martock which is perhaps Somerset's best preserved site, complete with water wheel and a complex of vast buildings. Flax was grown widely in the surrounding area to provide the raw material for rope, cord and sails.

The long history of the creation and maintenance of the drainage of the catchment is complex and fascinating. Sites such as the disused and active pumping stations have a great deal of potential for the interpretation of the development and effects of land drainage and current efforts to address the adverse impacts.

Two sites within the catchment are likely to be included on English Heritage's proposed Battlefields Register, namely Langport (battle of 1645) and Sedgemoor (1685).

There are at least 15 properties within the catchment which are listed in English Heritage's Register of Parks and Gardens of Special Historic Interest in England (1985) although few are linked to the water environment. Notable exceptions include Halswell Park at Goathurst, with fishponds, streams and cascades; and Barwick House, near Yeovil which is situated adjacent to the River Yeo.

6.2 FISH AND FISHERIES

We consider here the conservation of fish and their habitats. We also discuss angling and commercial fishing.

Our Objectives

The Environment Agency's principal objective is to maintain, improve and develop fisheries by:

- maintaining river bed and bank side diversity;
- maintaining adequate flow and depth;
- maintaining adequate water quality;
- maintaining the free passage of fish within a river system.

Wherever and whenever possible the Environment Agency will work to enhance all the above to improve fisheries.

The Role of the Environment Agency

As well as a general duty to maintain, improve and develop fisheries we have specific duties and powers to:

- regulate fishing by a system of chargeable licences. With the approval of the Ministry of Agriculture, Fisheries and Food (MAFF) we may also make byelaws to regulate fishing for example by restricting fishing methods and seasons;
- enforce regulations and byelaws to prevent illegal fishing;
- control the movement and introduction of fish;
- ensure chemical water quality in those stretches designated under the EC Freshwater Fish Directive (78/659/EEC) complies with standards. We also set river quality objectives to safeguard fisheries (see Section 7.1 Water Quality - Targets, State of the Environment and Issues).

Our work involves a range of activities:

- we survey rivers to check the number, age, and types of fish they support. If we identify a problem we try to improve the situation;
- we make sure that the abstracting water or the damming of rivers does not seriously disrupt the life cycles of fish;
- we consider the potential impact of development, river management and changes in water quality on fisheries and try to ensure that habitats are maintained and improved;
- we build fish passes;
- we improve fish habitat;
- we encourage angling and publish information for anglers;
- we rear fish to allow us to restock rivers for rehabilitation and mitigation purposes where fish may have been adversely affected by man-made or natural influences.

The Environment Agency will, where appropriate, seek to incorporate measures to maintain or improve fisheries as part of its other works or as a condition imposed in granting a

licence or consent. To assist in achieving these objectives the Environment Agency consults widely with anglers, fishery owners and others with an interest in fisheries. Some of this consultation was formal at both Regional and Local (Area) Fisheries Advisory Committees. The Environment Agency will continue this liaison with a new Regional Fisheries Committee, and in each Area with a single multifunctional Area Environment Group.

In carrying out the fishery objective the Environment Agency works to ensure that there is no conflict with its other duties including its duty to further nature conservation.

Local Perspective

EC Freshwater Fish Directive

Under the EC Freshwater Fish Directive various stretches of water have been designated as suitable for supporting salmonids or cyprinids (see Glossary - Appendix 2). These stretches are monitored for compliance with defined water quality criteria. (See Section 7.1.2 EC Directives Map - Map 25).

Fish populations

Fish are good indicators of the overall health of our rivers. We use special survey equipment and information from catch returns, counters and fish traps to assess the health of fish populations.

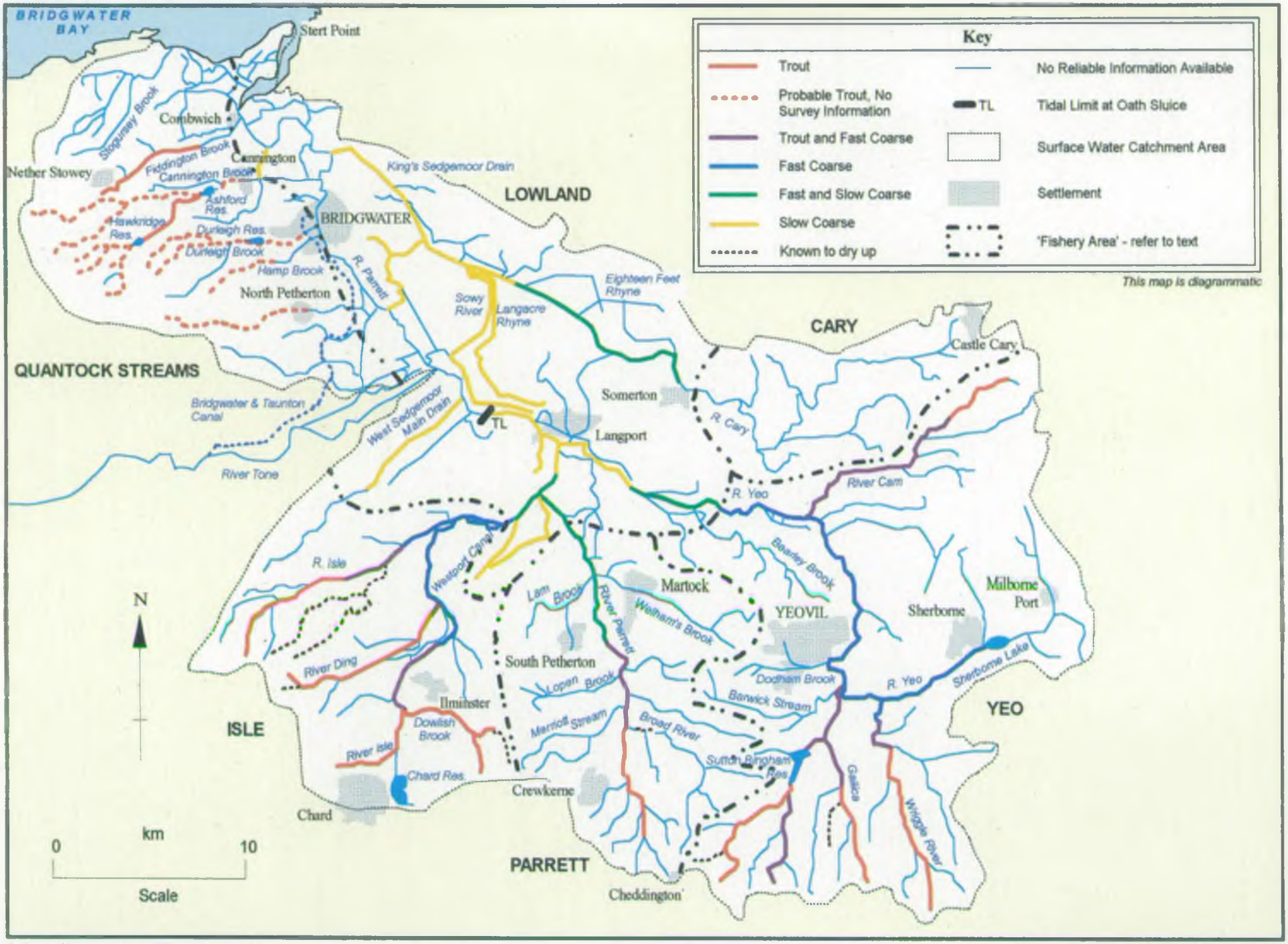
The Parrett Catchment is complex with much variation in geology, landscape and man-made influence. To provide an understanding of the fish populations the area has been divided into six fishery areas. One of the fishery area boundaries is the 10 metre contour and the remainder are watersheds. The fishery areas are shown together with the overall pattern of fish distribution in the River Parrett Catchment in the Fisheries Map - Map 10.

Fast Coarse are fish typically found in flowing water and include species such as chub and dace. Slow Coarse are fish typically found in slow moving or still water and include species such as bream and tench.

In the Isle fishery area the upper reaches and most tributaries are salmonid streams with resident self-sustaining populations of brown trout. These streams also contain bullheads, stoneloach, brook lamprey, and eels though the distribution of these species varies. The Dowlish Brook has particularly good numbers of brown trout and is probably the best stream of its type in the Parrett Catchment. The streams to the west including the River Ding and Fivehead River have an extremely variable flow pattern and trout populations are low and dispersed. The middle and lower reaches of the River Isle and the lowest reach of the Fivehead River are excellent coarse fisheries with high numbers of eels, chub, dace and roach in particular.

The Parrett fishery area has a small resident brown trout population in its upper reaches with eels, bullheads, stone loach, brook lamprey and minnows. Coarse fish especially dace, gudgeon and roach are increasingly common by the time the Parrett reaches the A303 at Petherton Bridge. Most species of coarse fish occur in the lower reaches including numbers of common carp which inhabit the deeper impounded stretches. The Parrett tributaries with the possible exception of some headwater streams like the Merriott Stream are not important

Map 10 - Fisheries



This map is diagrammatic

Information correct as of December 1996

fisheries. Some apparently significant streams like the Broad River dry up in a hot summer and others like the Chinnock Brook, Lopen Brook and Lambrook have habitat or water quality deficiencies.

The River Yeo fishery area contains several brown trout streams rising in Dorset. These include the Sutton Bingham Stream, Gallica Stream and River Wriggle. These streams are similar in character and contain all the usual minor species including bullhead and brook lamprey. One of the Sutton Bingham streams has a roach population above the reservoir and all three streams have coarse fish in their lowest reaches with dace, chub, gudgeon, brown trout and eels as the principal species. The River Yeo itself below Sherborne Lake to Bradford Abbas is a coarse fishery with increasing numbers of species as the river passes downstream. At Bradford a full range of fast water cyprinids occur with roach, dace, chub, eels and pike the dominant species. Below Yeovil velocities reduce and there are significant impounded reaches where a wide range of coarse fish occur though dace, chub, roach, pike and eels predominate. There are few tributaries of fisheries significance below Yeovil with the exception of the River Cam. Brown trout are occasionally found here but for much of its length the principal species are coarse fish and eels.

There is no recent information on the small River Cary fishery area but it is thought that the fishery is dominated by eels and small numbers of minor species.

The Quantock Streams fishery area contains numerous small fast flowing streams with self sustaining brown trout populations and associated minor species. The lower slower reaches of some of the streams are not physically suitable for brown trout and whilst larger streams like the Cannington Brook have roach and other coarse species the smaller streams probably only have eels and minor species.

The lowland fishery area corresponds roughly with that part of the Somerset Levels and Moors which lies within the Parrett Catchment. As well as the lowest reaches of the Rivers Isle, Parrett, Yeo and Cary there are numerous interconnected man-made channels, many dating back to the eighteenth century including the King's Sedgemoor Drain and West Sedgemoor Main Drain. All the major watercourses are important coarse fisheries with roach, bream, pike, tench, ruffe, and eels the dominant species. Rudd, gudgeon, perch and carp are locally important. A recently introduced species, the sunbleak, has established itself in the catchment and numbers are almost certainly increasing. Chub and dace are also present though these species may move upstream at certain times of year.

In the tidal reach of the river downstream of Oath Sluice freshwater fish may be found side by side with estuary fish such as mullet, flounders and occasionally bass.

Salmon and eels are the principal migratory species entering the Parrett Catchment. The tidal limit of the Parrett is a barrier to salmon when closed. Some weirs and sluices may provide some obstruction to eel migration but the only real barriers appear to be the large reservoir dams.

Fisheries surveys on the River Parrett were undertaken in 1989 and 1994, on the River Isle in 1992, on the River Yeo in 1993 and on the King's Sedgemoor Drain in 1990. Results of all these surveys are available in the Environment Agency regional library at Exeter.

Fisheries habitat, fish movement and significant fisheries problems

Isle Fishery Area

In the Isle fishery area the physical habitat is generally in a good semi-natural state with an excellent substrate of flinty chert which even lines some pools. In the upper reaches and in the tributaries there is a structure of alternating riffles and pools (see Glossary Appendix 2). Most trout over one year old live in pools but the riffle areas provide important cover for young trout, other fish and their invertebrate prey. Riffles are also essential for spawning trout which bury their eggs in gravel. The River Ding and Fivehead River have extremely flashy regimes and in the upper reaches the stream bed is composed in places of bedrock, boulder and cobble. In its lower reaches the River Isle retains an excellent natural substrate and a natural profile with many riffle, glide and pool features. The glides have the highest fish populations in summer but the pools are valuable refuge areas in high flow. The riffles are important for spawning chub and dace which often deposit their sticky eggs on stony substrates. Tree cover on the banks in this fishery area is extremely varied. The Dowlish Brook and parts of the upper Isle are generally tree-lined with alder which bind the banks and produce important areas of submerged (exposed tree roots) and overhanging cover for salmonids. The River Ding and Fivehead River are essentially wooded streams with a wide band of tree cover with a variety of species which provide not only cover but excellent shading, vital on a salmonid stream with naturally low summer flows. Parts of the River Isle are treeless and would benefit from planting. The lower reaches would be enhanced by tree and shrub planting but the main area where tree planting would benefit fisheries is the former water meadow area around Knowle St Giles. Temperatures in this salmonid reach can become close to acceptable limits in hot weather.

Parrett Fishery Area

In the upper reaches of the River Parrett several high weirs have been removed or have collapsed so that the river flows almost unimpeded and has a typical riffle and pool structure. The gravel substrate is easily silted here and cattle access causes localised problems. Several of the headwater tributaries have similar attributes and problems. Tributaries like the Chinnock, Lopen and Lam Brooks have a small fall for much of their length and are naturally silty in places. Weirs have a major impact in the middle and lower reaches of the Parrett itself. Below Chiselborough the river is almost continuously impounded by weirs with some of the old mills virtually on-stream. Consequently there is very little free flowing water: the only significant length being from the bottom of Ham Weir to just below Gawbridge. Weirs can be beneficial by creating deep refuge areas but they obstruct the free passage of fish and can reduce the diversity of habitat available by reducing velocity and encouraging silt deposition. If the structure has been in place for some time its loss or removal is likely to have a dramatic effect on river regime. From a fisheries viewpoint the resulting erosion, downstream siltation and loss of cover which would follow removal or lowering normally justifies the retention of most established structures. The upper and middle reaches of the Parrett itself are generally tree lined with alder and a mix of other species. Some pollard willows feature in the lower reaches. Many of the tributary streams by contrast have extensive treeless lengths.

Yeo Fishery Area

Downstream of Sherborne Lake the River Yeo was extensively reprofiled for flood defence and land drainage purposes in the 1970s. Over much of this length the river bed was lowered by approximately one metre and the river is still probably establishing a new regime and substrate. Since the scheme a thick growth of trees especially willow has established itself here. At Bradford Abbas the river has a good stony substrate but soon cuts through the sandstone exposing areas of bedrock. At Yeovil and downstream there are a number of weirs which impound long stretches but there are still significant lengths of free flowing river. The river course and appearance is semi-natural but the substrate is poor with large areas of sand, silt and smooth clay. Below Bradford Abbas on the Yeo tree cover predominantly of alder is extensive but patchy providing useful variations in shading and habitat. The Dorset tributaries have good riffle pool substrates though some of the lower reaches become quite sandy. Tree cover is extensive and some lengths are well wooded with a wide band of trees on the deeply incised banks which are a hallmark of these streams. The River Cam also has good riffle and pool substrate and extensive tree cover though the channel is not deeply incised like the Dorset streams.

Cary Fishery Area

The River Cary has a very small headwater spring flow and there is little fall as it meanders through a very flat landscape. The channel is quite silty and there is little in the way of tree cover in many areas. At Somerton the landscape changes rather dramatically and the river habitat improves with more reliable flow from local springs and streams. As a result of the low flows and lack of tree cover much of the Cary is very heavily weeded in the summer months.

Quantock Streams Fishery Area

The Quantock streams are largely semi-natural streams with riffle pool habitat and plenty of cover. Many of the streams flow through, or adjacent to, blocks of old deciduous woodland and more modern coniferous plantations, though the impact of forestry is not sufficient to have any obvious impact. Both the Durleigh and Cannington Brooks are impounded to form the Durleigh, Hawkridge and Ashford water supply reservoirs. The resulting compensation flows have some influence over the stream regime downstream but there are no dramatic habitat changes. In their lower reaches some of these streams now have little in the way of bankside cover and could easily be improved with tree and shrub planting.

Lowland Fishery Area

In the lowland fishery area the natural watercourses have a long history of alteration for flood defence reasons and this coupled with a regime of regular maintenance has reduced the variety of habitat which probably once existed. A huge range of man-made watercourses now interconnect with these rivers and provide additional albeit similar habitats. Substrates are generally clay, silt or peat. A requirement for machine access coupled with a natural absence of trees on the more exposed moors results in a rich assemblage of aquatic plants. Cover for fish species is provided by this plant growth and the depth of water. In many watercourses excessive growth of duckweed is a constant summer problem. Blanketing the water the accumulation of this tiny plant prevents light

reaching below the surface. This prevents photosynthesis in the water body and severe deoxygenation can result. The small size of duckweed makes its removal difficult and it is only effectively controlled by the judicious use of floating booms which can be managed to compact the weed and prevent it spreading. The duckweed is not a flood defence concern and its control is dependent on work by Environment Agency fisheries staff.

Existing water level management results in significant habitat change with the rivers penned in the summer and free flowing in winter. On some of the smaller drains and many rhynes an attractive summer habitat for fish can disappear in winter when levels drop. This seasonal variation reduces the apparent fisheries habitat and in some cases fish can be stranded in unsuitable areas.

Water control structures and their operation pose special problems for fisheries. Sluices which lift from the river bed as at Greylake, Dunball and Oath, can generate high velocities under the sluice and a flow pattern which is different from that of a natural fall. Fish near the structure may be stranded or swept downstream and unable to return. Tilting weirs may pose special problems for elvers migrating upstream as a result of the overhanging face.

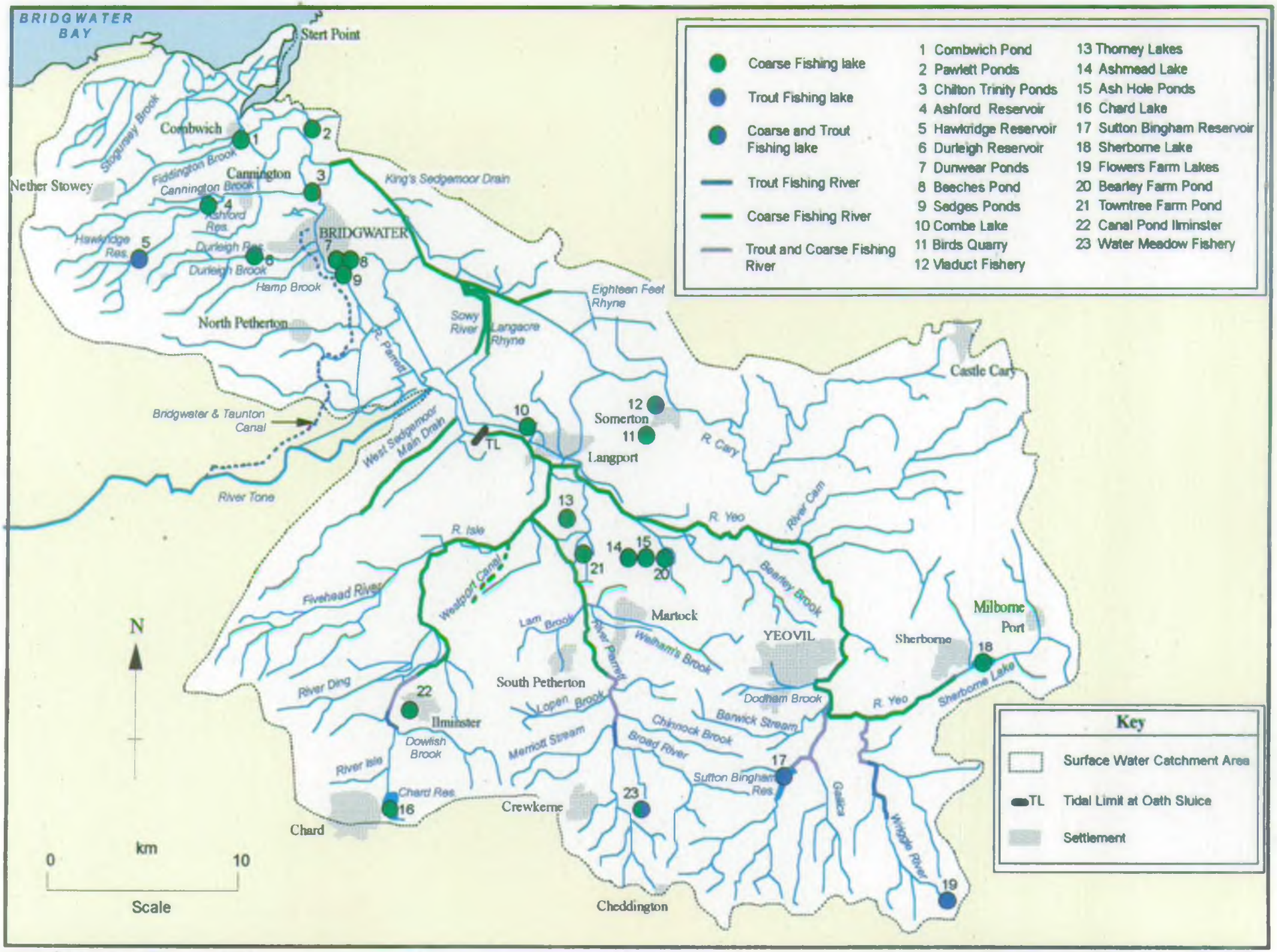
All the watercourses in this fishery area are regularly dredged and the weed cut by the Environment Agency, Internal Drainage Boards (IDBs) and landowners for flood defence purposes. The majority of fish species present in these watercourses spawn on weed and do not use the bed substrate for spawning. Dredging here is unlikely to remove fish spawning sites as it might upstream, but weed cutting could disturb spawning fish or remove spawn and will reduce the cover for fry. Dredging in spring and summer could suffocate eggs and fry. We carefully consider the timing of both dredging and weedcutting.

Long lengths of river in this fishery area have a U-shaped profile with very steep banks. This results in high velocities in flood conditions which are likely to affect fish populations adversely unless there are suitable refuge areas. Over-wide reaches, low-level weirs, bays, washlands and backwaters, and the confluence of streams and rhynes can provide valuable flood refuge areas. Some of these features would be shallow and weedy in summer and double as good spawning and nursery areas. There is considerable scope in this catchment to provide or enhance features of this type to improve fisheries, but no resources. Riparian owners and fisheries organizations may be interested in resourcing some of this work. There may be opportunities to undertake this type of work during routine Environment Agency maintenance where landowners are in agreement.

Lakes and ponds

There are numerous water bodies which are important fisheries in the catchment and a small number of ponds which are used by angling clubs as a source of fish for restocking. The largest lake is the 57 hectare Sutton Bingham Reservoir which contains brown and rainbow trout, carp and roach. Hawkridge Reservoir (13 hectares) on the Quantocks is also a brown and rainbow trout fishery though rudd and tench also occur. Other large on-stream waters include Sherborne Lake (19 hectares), Chard Lake (20 hectares), Durleigh Reservoir (31 hectares) and Ashford Reservoir (3 hectares), which are all significant coarse fisheries.

Map 11 - Angling



Information correct as of December 1996

In the Bridgwater area there are numerous disused claypits primarily at Combwich, Dunwear and Chilton Trinity which are all coarse fisheries. In recent years a number of purpose made fisheries have been created in the catchment these include the trout and coarse Viaduct Fishery at Somerton, and the Ash Hole and Ash Mead complex near Ash. All these fisheries add greatly to the fish resource of this catchment. In large lakes the nature of the substrate, the depth, area and shape of the lake and degree of wind exposure all exert an influence on the fishery. Good water quality is naturally essential but there are obvious differences in potential problems between on-stream, spring fed and enclosed waters.

Local Byelaws

There are no byelaws which are unique to this catchment.

Enforcement

There are few notable enforcement problems in the freshwater part of the Parrett Catchment. Most of the fisheries are natural brown trout and coarse fish. Where regular stocking does take place it only raises populations within the normal range found. In these waters there are few incentives for organized poaching and most enforcement involves rod licence checking. The only exceptions to this are the heavily stocked put-and-take trout waters where some problems have occurred and we have worked closely with the owners to apprehend offenders.

From January to May there is commercial fishing for elvers on the tidal River Parrett where the use of illegal instruments and licence evasion are always potential problems (see Section below on Commercial Fishing for Salmon, Trout and Eels). Enforcing the legislation to regulate elver fishing is undoubtedly the major commitment in this catchment.

Angling

Angling in watercourses

Regular angling in the catchment takes place on the Rivers Isle, Parrett, and Yeo and on the King's Sedgemoor and West Sedgemoor Main Drains. Many of the smaller streams and large rhynes are also fished including the Sutton Bingham Stream, River Wriggle, Langacre Rhyne and Sowy River. (See Map 11 - Angling).

The fishing rights in this catchment are mostly leased by clubs with open membership, and rights tend to be quite extensive and continuous for a given club.

On the King's Sedgemoor Drain, West Sedgemoor Main Drain, Langacre Rhyne and Sowy River most of the fishing rights are owned by the Environment Agency and leased to clubs with open membership. The Environment Agency ownership also includes significant lengths of the Parrett, Isle and Yeo near Langport. The larger waters are used not only for pleasure fishing but also for match fishing competitions. The King's Sedgemoor Drain is one of the venues in Somerset used for the National Angling Championships.

Angling in lakes and ponds

Sutton Bingham and Hawkridge Reservoirs are owned by Wessex Water plc and managed as put-and-take trout fisheries which are regularly stocked with both brown and rainbow trout. The reservoirs are open for fly fishing with both season and day permits. Durleigh Reservoir is also owned by Wessex Water and is run as a coarse fishery with day permits. There are an increasing number of still waters open to the public for fishing for both trout and coarse fish. Examples of this sort of development include the well established Viaduct Fishery at Somerton which offers both trout and coarse fishing and Flowers Farm at Batcombe which is a popular put-and-take trout lake fishery.

Sherborne Lake, Chard Lake, and many of the clay pits around Bridgwater are owned or leased by local angling clubs with both season and short period permits available.

Some of the other lake and pond fisheries in the catchment are fished by the owners, by small syndicates or by day ticket. Other still-waters are retained by owners or anglers and used as a source of fish for restocking.

Commercial Fishing for Wild Fish Stocks

There is no commercial fishing for wild fish stocks in the freshwater part of the catchment. From January to May there is commercial fishing for elvers on the tidal River Parrett. Fishing activity is greatest during spring tides and during the hours of darkness; conditions which increase the numbers of elvers entering these tidal reaches.

It is difficult to quantify the impact of this commercial fishing particularly when serious gaps remain in our understanding of the eel's life history. Eels are believed to spawn in the Sargasso Sea but no mature eels have ever been caught. It is for this reason that the commercial catch of elvers is so valuable as elvers are a necessary starting point for the farming or growing on of eels. There are few eel farms in the UK and most elvers are exported to the continent.

There is some commercial fishing for salmon in the tidal reaches of the River Parrett between Bridgwater and Huntspill. Licensed fishing is by dip net although few licences have been issued in recent years. There is also fishing by butts or putchers (privileged fixed engines) under the terms of a certificate issued by the Special Commissioners for English Fisheries in 1870.

Byelaws

A licence is required for elver fishing. The method of fishing and the instrument which can be used is defined by byelaw. Nets must also be numbered with tags which are issued to persons who have purchased licences. Eel and elver fishermen are required to make an annual catch return.

Enforcement

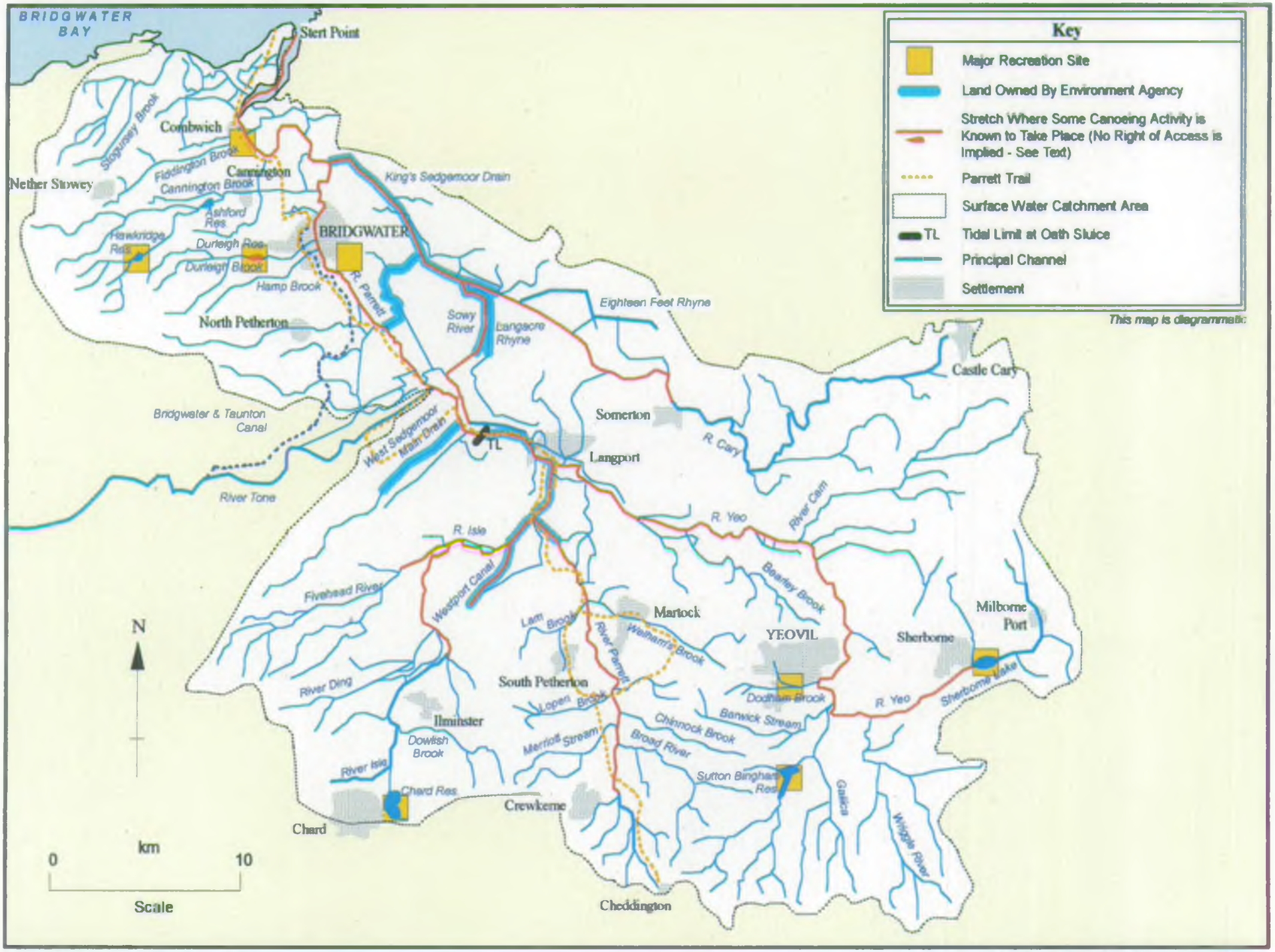
There are periodic problems with licence evasion and the use of illegal instruments.

The future

If it becomes evident that commercial fishing for elvers is having a measurable impact on local eel stocks there may be a case for imposing additional restrictions on fishing. There are only limited means to achieve this with current legislation. There is an urgent requirement for international research to discover more facts about the life history of the common eel in the open sea. There are problems with evaluating elver populations. Catch returns are not considered reliable enough as evidence of change. In addition normal methods of fish surveying do not lend themselves to monitoring elver numbers. However, an NRA R&D project was carried out in 1994 in the Rivers Severn and Avon (R&D Project Record 256/13/ST) which attempted to look at the question of the sustainability of the eel and elver fishery.

In the near future we will be carrying out a survey of barriers to eel and elver migration in the North Wessex Area with a view to improving migration.

Map 12 - Recreation and Amenity



Information correct as of December 1996

6.3 RECREATION AND AMENITY

Many people spend their spare time enjoying our rivers and coasts. Where we can we try to improve facilities for these people but we must always safeguard the environment from the damage they might cause.

Our Objective

To develop the amenity and recreational potential of inland and coastal waters and associated land, where appropriate.

The Role of the Environment Agency

We have duties and powers to:

- protect and maintain access to beautiful areas or special sites of interest;
- make sure that land and water under our control is made available for recreation and that we cater for the needs of the chronically sick or disabled;
- charge for facilities that we provide for recreation;
- make byelaws to regulate recreation.

We are involved in a range of activities:

- We work with other agencies and individuals such as planning authorities and sports associations to develop recreation facilities.
- We work with other organizations to develop plans and strategies for promoting recreation in the water environment.
- We provide information.
- We manage Environment Agency owned or leased land with recreation in mind.

Local Perspective

The main water-related recreational facilities are shown on Map 12 - Recreation and Amenity. A long distance footpath, the Parrett Trail, is being established by a partnership of many organizations supported by European funding. The trail opened in the summer of 1995 and follows the river from source to sea. A trail guide is available from Tourist Information Offices and local bookshops for a modest charge. Parts of the route are on land owned by the Environment Agency. Some problems of obstruction to access have been reported but it is early days for the Project which is proving a very successful partnership venture. Canoeing has a small but dedicated following in the catchment with large parts of the lower reaches regularly used (See Map 12 Recreation and Amenity). The canoe clubs negotiate access agreements with riparian owners and observe the Environment Agency's code of conduct for canoeists "Have fun, have a care" information for river canoeists leaflet. Huish Episcopi Sports Centre at Langport has canoes for use both in the pool and on the river.

Bridgwater Bay National Nature Reserve (NNR) is an important and popular area for casual recreation and bird-watching. The land between High and Low Water Marks Ordinary Tides is owned by the Environment Agency, and hides have been built by English Nature (EN) on Fenning Island. A nature reserve management plan has been drawn up by EN

which also addresses visitor management. Members of Burnham Yacht Club can obtain permits to land on Stert Island.

The Westport Canal is owned by the Environment Agency and is currently used mainly by local people for casual recreation such as dog walking and bird-watching. The old canal is an important habitat for wildlife and we plan to enhance its conservation and recreation value. We also own several bridges of historic interest which cross the canal and have proposals to strengthen them. A management plan for the area is currently being prepared, with a programme of tasks to be implemented over a five year period.

We own substantial tracts of land adjacent to the King's Sedgemoor Drain with public access and car parks, primarily developed for use by anglers but with the potential for use by other groups including canoeists. A management plan will be prepared for the King's Sedgemoor Drain to enhance its value for conservation and recreation. A similar assessment of the Isle/Yeo confluence could be carried out, where we own the land and the river is ideal for canoeing. Although there are no formal agreements, canoeing occurs on the Parrett and the Yeo around and upstream of Langport.

Reservoirs and Lakes

Sherborne Lake is a popular area where the main activities are fishing and casual recreation within a historic parkland setting. Its restoration as a valued recreation area and the safety of its embankment was secured by the National Rivers Authority's (NRA) predecessors - Wessex Water Authority. The NRA continued to monitor its success although the lake is in the ownership of the Sherborne Castle Estates.

Sutton Bingham Reservoir is owned by Wessex Water Services Ltd (WWSL) and is a popular venue for sailing and fishing, with a picnic site. Its popularity for recreation gives rise to a certain conflict of interest with nature conservation.

Durleigh Reservoir and Hawkridge Reservoir on the Quantock edge are owned by WWSL. Durleigh is used for sailing and as a coarse fishery, whilst Hawkridge Reservoir has a network of footpaths and supports a trout fishery.

Chard Reservoir is owned by South Somerset District Council and managed as a Local Nature Reserve. Its principal interest is bird-watching and fishing.

The old brickpits at Combwich, and at Chilton Trinity and Dunwear near Bridgwater are principally used for fishing. Dunwear is owned by Somerset County Council.

The Estuary

There are two boating clubs at Combwich and four based at Burnham. Many of these boats use the Parrett Estuary.

Port of Bridgwater

Sedgemoor District Council is the statutory port and pilotage authority for the Port of Bridgwater. Duties include conservancy, for example the maintenance of lighthouse, buoys and beacons, regulating shipping movements, and operating the pilotage service. In addition

to complying with various general harbours, shipping and pilotage legislation, the council has a general duty of care to all users of the port area.

The most recent local enabling legislation, the Act of 1845, shows the port area as including Bridgwater Bay from Brean Down to Hinkley Point, a small part of the south of the Axe Estuary, the tidal River Brue, and the River Parrett as far as Bridgwater. The exact seaward boundary is shown on BA Chart 1152. Commercial wharves at Dunball and Combwich are within the port area but are operated privately.

Dunball Wharf has a sea dredged sand business, ARC, and a cargo operation, mainly imported bulk animal feeds, fertilisers and suchlike, managed since August 1995 by Watts Transport. In 1994, 71 vessels visited the wharf, bringing a total of 77,185 tonnes of cargo. The largest vessels visiting Dunball Wharf are over 2,000 tonnes deadweight (2300 tonnes is the largest to date).

During 1995, Combwich Wharf was re-furbished for the transportation of a small number of heavy lift cargoes for Nuclear Electric.

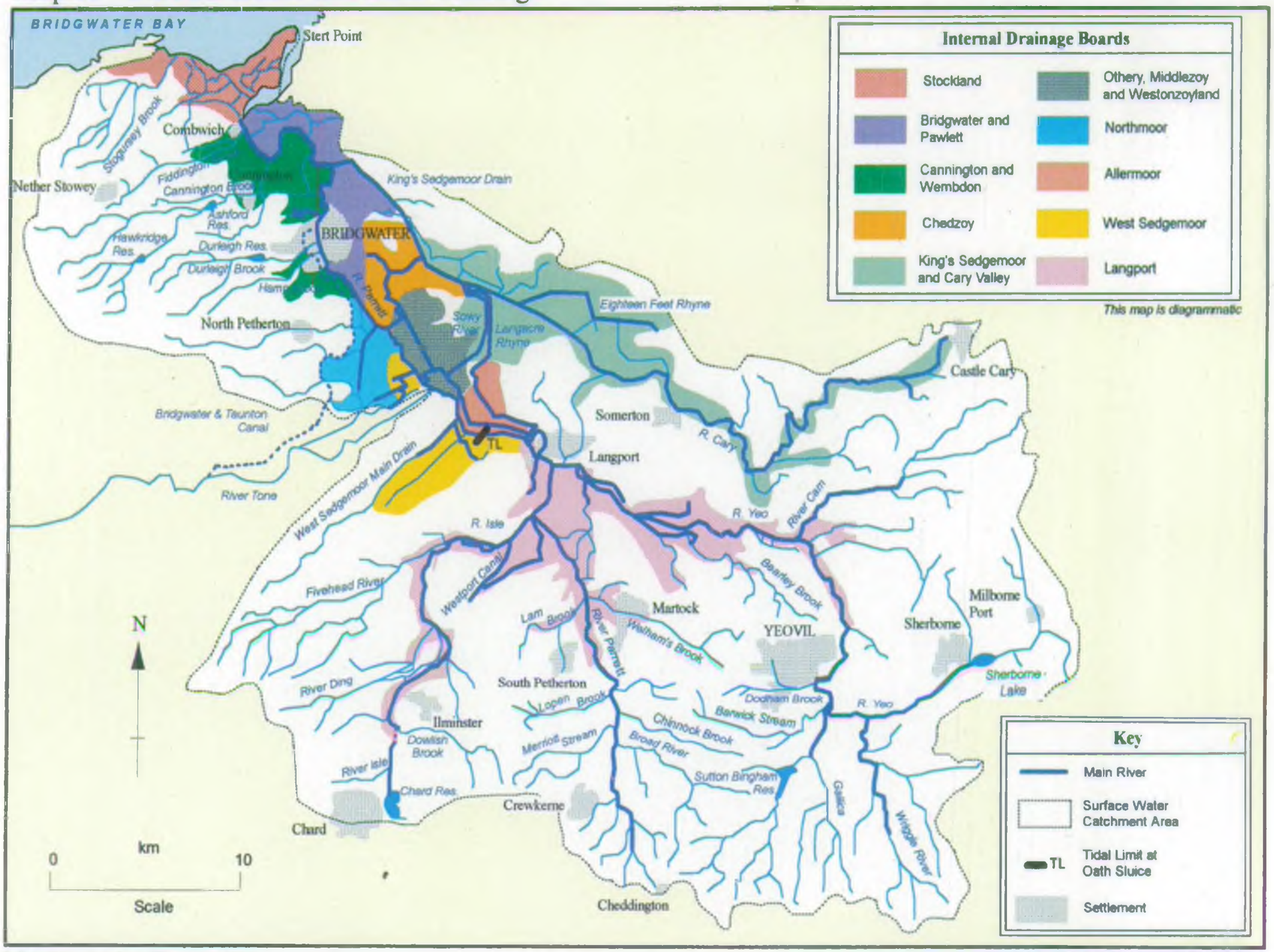
Public Open Space

Areas of public open space abut rivers at Langport and Yeovil (Nine Springs) and these areas undoubtedly have the potential for enhancement. The land is intensively managed and has a parkland atmosphere - the management could be changed and planting carried out to make the areas more natural. There is a problem with litter at these locations.

Public Footpaths

The catchment is fairly unusual in that many of the rivers, particularly the Parrett, Isle and Yeo, have public footpaths running along one or both banks for considerable lengths so that recreation such as walking and bird-watching can take place, although it is not specifically catered for. Somerset County Council is responsible for ensuring that public footpaths are open and passable with adequate signing and stiles. There is scope to promote the use of the designated bridle-ways within the catchment where horse riding and cycling can occur in addition to walking and bird-watching.

Map 13 - Flood Defence and Land Drainage



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6.4 FLOOD DEFENCE AND LAND DRAINAGE

River flows vary widely and are affected by the weather, geology and land use. We manage flood risk from rivers and the sea using Flood Defence and Land Drainage powers.

Flood risk and land drainage have always affected the way we use land. By improving our control of water we have been able to make better use of river and coastal floodplain for farming or building towns. This control can take many forms: from simple channel alterations to major floodbanks and artificial washlands. Works constructed for other purposes, such as weirs, mills and bridges, have also altered the natural river system.

Better protection from floods and better land drainage has improved our quality of life. However, unless properly managed, these benefits may result in other problems such as increased downstream flows and a legacy of expensive works for future generations to maintain. Changes in land use, made possible through drainage and flood defence, may also cause significant environmental damage, particularly to wetlands.

Today we manage flood defences and water level management to balance the needs of all river users with the needs of the environment.

Our Objectives

To provide effective defence for people and property against flooding from rivers and the sea; and to provide adequate arrangements for flood forecasting and warning, and where possible to manage water levels sensitively to support water level dependent habitats and species.

The Role of the Environment Agency

Legislation tells us what we can and cannot do. Our statutory flood defence committees make decisions on flood defence. All rivers are classified as either "main river" or "ordinary watercourse" (sometimes referred to as "non-main river" - see Map 13 - Flood Defence and Land Drainage). We supervise all flood defence matters but have special powers to carry out or control work on main rivers and sea defences. Local authorities and in some areas internal drainage boards are responsible for flood defence on ordinary watercourses. Local authorities have powers to carry out sea defence work and in addition coast protection work - to protect the coast from erosion or encroachment by the sea.

We have duties and powers to:

- control certain works and advise planning authorities on flood defence;
- maintain and improve the flood defences under our control;
- provide flood forecasts and warnings so that risk to life and damage to property is reduced during river and sea floods.

We are involved in a range of activities:

- We work closely with other agencies including the Ministry of Agriculture, Fisheries and Food (MAFF), local authorities, internal drainage boards, conservation and recreation bodies on work such as Water Level Management Plans and Raised

Water Levels Areas.

- We survey assets and flood risk areas to improve our management of flood defence.
- We are working on a Flood Defence Management Framework and related systems to ensure that flood defence assets are managed properly.
- We set and monitor specific targets to improve our performance.
- We support Research & Development and are developing best practices for our work.

Global Warming

The future planning of sea defences needs to take account of possible sea level rise due to global warming. The Agency has agreed an approach with MAFF, who grant aid much of the Agency's flood defence work, to allow for sea level rise within scheme design. The design policy is under constant review.

The Intergovernmental Panel for Climate Change predictions for sea level rise are used with allowances for any land movement (tectonic changes). The net sea level rise estimates are then used to establish the anticipated effects of the life of the scheme. The approach is to design the works so that as sea level rise occurs the defences can be raised without having to rebuild the whole structure.

Raising the level of defences above that necessary today can only be justified where evidence of actual sea level rise supports the need.

The current allowances for the south west region of the Agency are a rise of 5 mm/year until the year 2030 and 7.5 mm/year thereafter.

A further effect of global warming is that of increased storminess, potential consequences of this include increased wave action and great precipitation.

Local Perspective

Historical Background

It is believed that a thousand years ago the River Parrett and its major tributaries the Isle and Yeo meandered through the moors upstream and downstream of Langport in river channels more or less untouched by man's influence. The lack of gradient would have produced shallow, un-embanked natural watercourses subject to severe siltation due to uncontrolled tidal intrusion. Fluvial flows would have exceeded channel capacity for a large proportion of the time. Even an average winter's rain would have put most of the low-lying basin between Moorland and Martock under water until the following summer. Furthermore the fortnightly spring tides would have covered large areas each side of the river channels giving salting-type conditions far inland. Conditions would have been further worsened because the River Cary joined the Parrett at Burrowbridge before its re-routing to Dunball in about 1793.

However the area was by no means the useless waste described by some contemporary observers. Even the lowest peat moors, with their extensive areas of open water, reedbeds and marsh would have been exploited as fisheries and wildfowling areas and where possible peat and willows were harvested. Higher areas, especially where clay soils were found on

the surface, were grazed when water levels permitted. On the islands of higher ground (the "zoys") some arable cultivation may have been practised. The catching of fish and eels was also very important. Artificial weirs ("gurgites") were constructed in the main watercourses to hold up water levels to improve the fisheries. Not surprisingly this practice worsened flooding and caused much local dissent.

Before the 13th century the moors were subject to such disorganised commoning arrangements that any interest in drainage development was virtually non-existent. However, the Statute of Merton in 1235 gave significant new powers to enclose and occupy the moors and reclamation activity then moved forward apace, mainly at the initiative of the church. Flood protection of the land in the river basin started with the piecemeal reclamation of small "polders" sited adjacent to higher clay ground close to the hills. Modest embankments were constructed to reduce the frequency of inundation. The intention was to extend the period during which the land could be used and possibly enable areas previously fit only for fishing and wildfowling to be used for summer grazing.

Interest soon extended to the improvement of the Parrett's levee (the slightly higher ground alongside the river formed naturally by the settling out of silt from floodwater). Although naturally drained by its elevation, the proximity of the Parrett would have meant almost continuous overflow throughout the winter and spring months. So by the beginning of the 14th century a raised floodbank had been formed along the entire reach from the high ground at Langport to the inland boundary of the higher coastal clay belt at Moorland. Cut-off banks ran back to high ground to compartmentalise the protected area. These extensive works must have made a tremendous improvement to conditions - possibly greater than any other measure carried out before or since, and it is recorded that there were extensive crops of barley, peas, beans and oats in Earlake (North of Burrow Mump) in 1311.

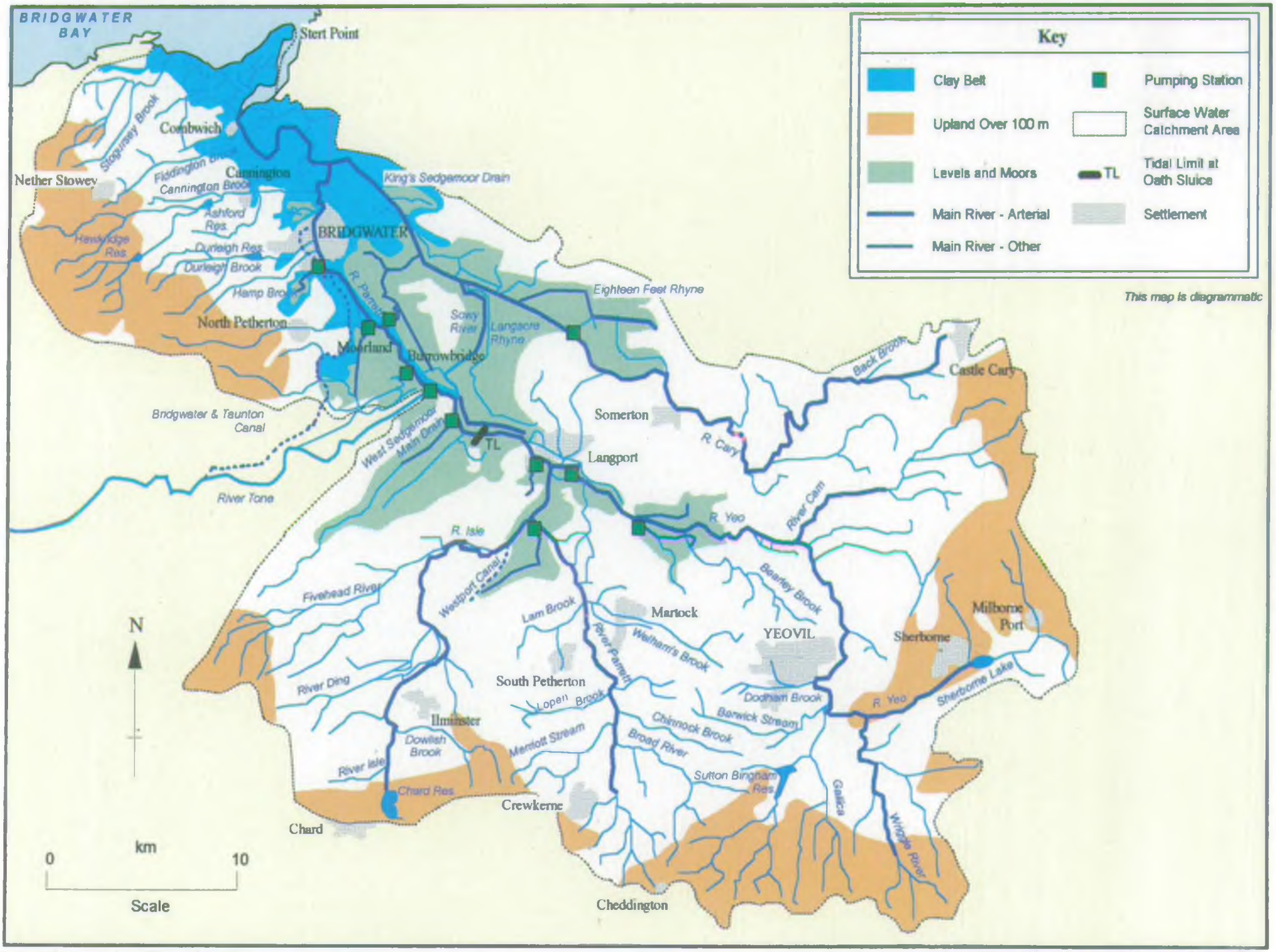
Topography, Flooding and The Drainage Network

The particular drainage and flood alleviation works which have been carried out in the catchment over the last millennium are closely related to the local topography and surface geology. Map 14 - Drainage, shows the three main zones of surface elevation -the peripheral uplands, the levels and moors and the estuarial belt.

The rivers in the peripheral uplands drain naturally along valleys with mostly narrow floodplains. Until this century, man's influence here was restricted to damming and diversion for milling purposes. However since the middle of the 20th century the main engineering activity has been the provision of numerous local flood protection measures for populated areas such as Sherborne, Ilchester and Langport as well as many smaller settlements. On Main Rivers these schemes have been built and maintained by the Agency, but on minor watercourses (non-main river) the relevant District Council or Drainage Board undertakes the task.

Further downstream in the moorland zone the arterial rivers are characterized by raised floodbanks with counterbanks running back to higher ground to compartmentalise the low-lying areas. About 10% of the Parrett Catchment would flood regularly but for these embankments which over the centuries have been adapted to confine the most frequent or

Map 14 - Drainage



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serious flooding to the zones best suited for this role. In certain cases zones become flooded on a hierarchial basis, one zone overspilling into another when its capacity is reached. Other zones remain unaffected by overtopping and have only their own "internal" water to cope with. Because most of the overtopping occurs over fixed floodbanks the Agency's operational engineers can do little to influence which areas will flood in any particular flood event, this being determined mainly by where the rain falls, how intense the rainfall is and how wet the ground is before the rain falls.

Outside the floodbanks each moor is drained by its own network of minor channels, most of which were cut artificially when the moors were reclaimed and enclosed in the 18th and 19th centuries. Outfalls into the arterial rivers are provided through the floodbanks with sluices to prevent backflow. Although extensive areas rely on gravity drainage, pumped drainage has been provided for about 25% of the moor area to enable the clearance of surplus water when the arterial rivers are in flood. The first of these was Westonzoyland, where the county's first steam land drainage pump was installed by the newly constituted Drainage District in 1830. Over a dozen further stations followed, the last being Long Load in 1974. Map 14 shows the location of the drainage pumps currently in service. However since most of the stations discharge their water back into the adjacent main river, discharge cannot commence until the floodlevel in the main river subsides and, in the event of persistently wet weather, widespread flooding of the moors can still occur.

The Allermoor, Chedzoy and Southlake "engines" are no longer in use having been superseded by subsequent drainage schemes, but pumping continues at all the other sites. All major pumps in the Parrett Catchment are operated by the Agency which runs an extensive programme of maintenance and modernisation work, electric power now being almost universal. The last steam pump was taken out of service in the mid 1950s whilst Westonzoyland remains the only station still relying solely on diesel power.

On the major rivers numerous sluice structures have been provided. These are used during summer months to impound the rivers for the purpose of summer water supply. The operation and maintenance of these structures and the associated distribution systems is essential to the unique nature of the adjacent land and is often not recognized as one of the Agency's most important Flood Defence functions.

Regulation and our work with planning authorities

Historically urban development has suffered flooding as a result of overtopping of flood defences. The majority of urban development in the catchment is now protected against tidal and fluvial flood risk to contemporary flood standards, although there are instances of some modern development having a lesser standard of protection. We can control some types of development using our own powers under the Land Drainage Acts.

In accordance with DoE Circular 30/92 "Development and Flood Risk" the Environment Agency, as advisors to planning authorities, aims to ensure that new development is not affected by flood risk, and that existing development is not adversely affected by increased runoff from new development. The Environment Agency's Development Control Department therefore negotiates with developers on behalf of the Local Planning Authority, to ensure that all necessary infrastructure works are provided as part of any development, to protect the development and third parties against flood risk to an agreed standard, whilst also safeguarding the ability of the watercourse to carry flood water and conserving it as an

ecological corridor. These aims are being achieved with the provision of set back development and riverside enhancement works for the benefit of the general public where appropriate.

Section 105 of the Water Resources Act 1991 requires the Environment Agency to exercise a general supervision over all flood defence matters. Section 105(2) of this Act requires us to carry out surveys of the areas in relation to which it carries out its flood defence function. It is these surveys referred to as "Section 105 - 30/92 Surveys" that are seen as our main input into the preparation of development patterns in a pro-active rather than a reactive way to individual requests and consultations, in accordance with the Government's planned approach to planning and development control. Amongst other things, the survey should indicate areas where flood defence problems are likely. In particular, it will help to identify the extent of the floodplains, washlands and other land liable to flood, in relation to risk; along some coastlines they may identify set-back lines beyond which most development should be avoided.

To ensure that planning officers are aware of the services offered by the Environment Agency with respect to Town and Country Planning issues and flood risk, we have regular officer to officer contacts for each District Council LPA on a daily or weekly basis.

Responsibility for flood defence matters rests with the Environment Agency. In order to carry out our role successfully it is essential that anyone who intends carrying out works in a watercourse which may obstruct or impede the flow obtains our consent **before** starting work. The reason for this is to ensure that any works do not endanger life or damage property by increasing the risk of flooding. What constitutes a valid land drainage consent application is a fully completed application form together with all necessary supporting documentation and relevant fee. To assist the applicant in submitting a valid application for consent we provide a full set of guidance notes and technical information sheets to cover the most common topics such as bridges and outfalls.

Byelaws/Consent Audit

As part of the documentation issued with land drainage consents we provide notification cards by which the Consentee notifies the Agency of the start and completion of the consented works. The cards are sent to our Operations Engineers who visit the sites to ensure that works are carried out as per the issued consent.

Maintaining flood defences

Our maintenance and operational activities are concentrated in the levels and moors and the coastal sections of the Parrett Catchment.

Channel weedcutting is carried out annually between Langport and Thorney using a dragline excavator fitted with a special weed-mowing bucket. Extensive weed control is also undertaken in the many other Agency controlled rivers, pump drains and summer water feed rhynes in the catchment. This work is usually carried out up to three times per year using a combination of handwork and hydraulic excavators fitted with weed-mowing buckets. On most of these lengths weedcutting is preceded by bankmowing. This is particularly important to control tree and bush growth where ungrazed raised floodbanks are present. Unchecked growth eventually causes a dangerous loss of structural integrity to earth

embankments through root damage. Dense scrub can also encourage rabbits and badgers to excave in the banks, causing damage which is very costly to remedy.

Every other year silt is dredged from the tidal length between Oath Sluice and Burrowbridge using the agitation method. The reach downstream of Burrowbridge has not been dredged as a matter of routine for many years, but this is now under review following dredging in 1995 and 1996. The non-tidal Parrett and the many tributaries require less attention and are dredged only when necessary - about every 10-15 years - at their downstream ends but very rarely in the headwaters.

During dredging operations the resultant spoil will usually be used to make up adjacent floodbanks where appropriate, thus saving the cost and disruption of importing material. The opportunity is taken to incorporate conservation enhancement measures where possible, thereby contributing towards the Agency's obligation to further wildlife conservation in the performance of its flood defence activities. Fencing and gateways are repaired or replaced as part of the general reinstatement work associated with these schemes.

There are a large number of pumping stations in this area - Westonzoyland, North Moor, Salt Moor, Stan Moor, West Sedge Moor, Westover, Huish Episcopi, Midelney, Long Load and Henley - as well as several major sluices: Oath and Thorney on the Parrett, Beer Wall and Monks Leaze on the Sowy, Dunball and Greylake on the King Sedgemoor Drain and Ablake and Long Load on the Yeo. All these, plus an even greater number of minor water level control structures, receive regular attention to ensure that they are mechanically and structurally sound. Most routine maintenance is carried out by the regular operators, but major mechanical and electrical work is usually entrusted to outside specialists. Other maintenance work includes repairs to gaugeboards, fencing, gateways, accesses, bridges, floodbanks and floodwalls (tidal and non-tidal), revetments and buildings, plus treework on the upper reaches and the jetting of outfalls in the tidal lower reaches.

Routine operations aim to provide controlled water levels in the rivers and moors, balancing the needs of people living in the area with those of agriculture, fisheries, water quality, wildlife, navigation and amenity. Simplistically this involves draining surplus water in the winter and capturing freshwater from the rivers for distribution in the summer, using the complex network of watercourses, sluices and pumping stations. This work is carried out in close liaison with the local Internal Drainage Boards and other local interests. (See Map 13 - Flood Defence and Land Drainage).

Emergency Response

In flood situations the Agency's response is triggered either by a weather warning from the Met Office or by abnormal conditions identified by one of a team of duty officers, who maintain a continuous watch on rainfall and river levels via the extensive telemetry network.

Any response is twofold - the issue of flood warnings and the management of the river systems to minimise any adverse effects. Flood warnings are issued to the emergency services, relevant local authorities, the general public and to the Agency's own operational staff. Until recently most public warnings were issued via the Police but responsibility has now transferred to the Agency. In most cases the Agency now uses automatic equipment to pass telephone warnings directly to the public.

Operational flood control remains an Agency task and comprehensive written procedures are maintained to ensure that in unusual circumstances or emergencies, appropriate responses are made.

6.5 THE BUILT ENVIRONMENT AND DEVELOPMENT PLANS

Here we consider the built environment and the process of planning and regulating the construction of new development including roads, housing and industry.

County and district planning authorities plan and control development; although they must consult the Environment Agency they do not have to follow our advice.

Our Objectives

To protect the environment from the harmful effects of development and to minimize flood risk.

The Role of the Environment Agency

There are two main ways we can influence development:

- through the **planning** system we can assist local planning authorities to allocate land for development by commenting on local plans, identifying constraints and highlighting where the river environment can be enhanced by sympathetic development. We will continue to advise on water related issues in our comments on structure and district wide local plans.

- we can advise planning authorities on the **control** of development by offering formal and informal comments to planning authorities on planning applications and development guides. We can also control some developments using our own powers for example Land Drainage Consents (see Section 6.4 - Regulation and our work with planning authorities).

We are also active at a higher level informing strategic planners of our environmental concerns, for example rivers affected by over abstraction or water supplies threatened by major pollution hazards.

Local authorities prepare statutory development plans. In January 1994 the NRA published guidance notes for local planning authorities on ways of protecting the water environment through development plans. The notes highlight topics that concern us and offer guidance on model policies.

Planning and Flood Risk

The Government view is that development should be guided away from areas that may be affected by flooding and should be restricted where it would increase the risk of flooding. To achieve this it expects local authorities to use their planning powers and the Environment Agency to assist by providing advice on development and flood risk. The work that is underway now on preparing flood plans is an example of this advice. (For details see Flood Defence Sections 6.4 and 7.3 Flood Defence and Conservation).

Local Perspective

(i) *Development Plans*

The Regional Planning Guidance for the South West (July 1994) indicates the need for protecting important landscape areas such as the Somerset Levels, the Blackdowns, the Quantocks and coastal areas, to take account of nature conservation interests. The local authorities are advised to work closely with the Environment Agency: flood defence, water resources, sewerage issues, pollution prevention, water supply safeguards and capacities of existing and planned infrastructure are all seen as matters to be considered. It is recognised that the Region should be providing for new dwellings and Somerset should be catering for up to 2,500 new dwellings each year between 1991-2011 mainly in and around urban areas. The Somerset Structure Plan Review and the Dorset County Structure Plan identify the numbers to be provided for within the catchment. The Guidance indicates that economic growth and business competitiveness needs encouragement at an appropriate scale.

The majority of the catchment is within the area of the approved Somerset Structure Plan - Alteration No 2 adopted 1992, which contains the strategic Town & Country Planning Policies. This is currently under review. The Dorset County Structure Plan was placed on Deposit in January 1996. The catchment includes most of South Somerset District and a major part of Sedgemoor District. Also it includes parts of West Somerset, Taunton Deane, a very small area of Mendip and part of West Dorset District Council areas (see Built Environment and Development Map - Map 15). Detailed planning policies are contained mainly in the local plans of the District Authorities - see below but note that final development allocations are subject to the political process and may change.

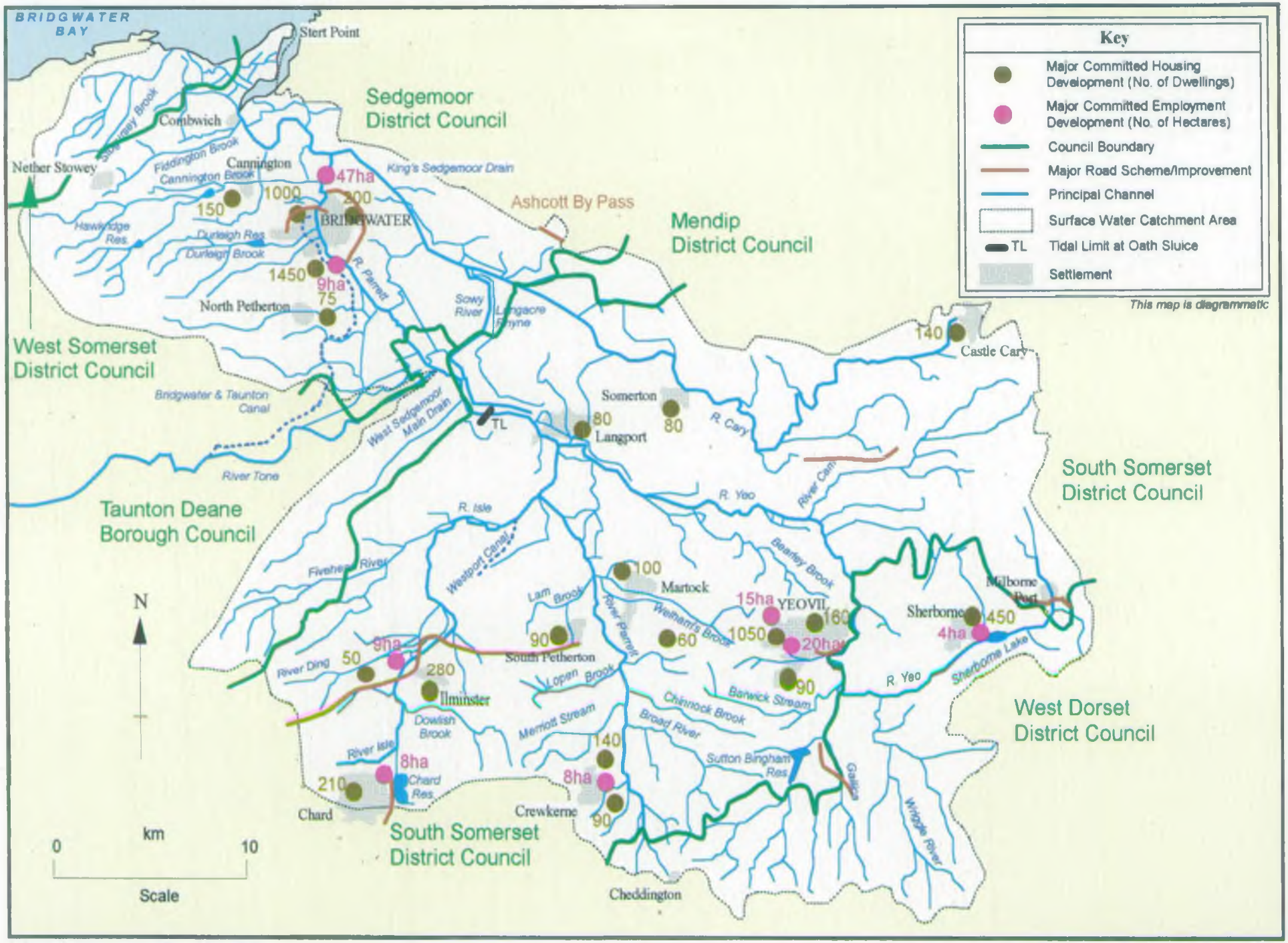
South Somerset

Yeovil Area Local Plan	October 1990
Crewkerne Local Plan	July 1984
Wincanton Local Plan	June 1987
Chard and Ilminster Local Plan	February 1995
Langport and Somerton Local Plan	January 1993

NB The South Somerset Local Plan (Draft for Consultation) Report 1994 was a precursor to the publication of a District Wide Local Plan. The Deposit Plan which will provide for development to 2011 is currently being discussed.

A number of road improvement schemes are planned within the catchment, the principal proposals are shown on the Built Environment and Development Map - Map 15.

Map 15 - Built Environment and Development



Information correct as of December 1996

Sedgemoor

Bridgwater Area Local Plan August 1995.

NB A District Wide Local Plan is currently being prepared which will provide for development to 2011. An Issues and Options Report should be published in 1997 and the Local Plan document in late 1998/early 1999.

Taunton Deane

East Deane Local Plan March 1991.

NB The Borough Wide Local Plan is being prepared and an Issues and Options Report was published in 1995. The Council intend to publish a further Local Plan document in summer 1997 that addresses development changes to 2011.

Mendip

Glastonbury and Street Local Plan. First Review March 1994.

NB The District are preparing a District Wide Local Plan for the period to 2011 and a Local Plan document is likely to be published autumn 1997.

West Dorset

The West Dorset District Local Plan Deposit 1994.

This has been the subject of a recent Public Inquiry. It guides development proposals to 2001.

A non-statutory strategy for the Somerset Levels and Moors was prepared by Somerset County Council in 1983. This aimed to achieve working relationships between interested bodies to secure the protection of the landscape, nature conservation, archaeology and other interests of this wetland area. The Levels and Moors Partnership has been established to consider current issues and problems.

(ii) ***Future Changes***

It is estimated that the 1991 population of the catchment was some 196,000. By 2001 it will have risen to about 218,000.

Somerset

The approved Somerset Structure Plan 1993 sets provisions for housing, shopping and employment growth to 2001 and within the catchment area identifies Yeovil and Bridgwater as the Principal Centres for development. Smaller settlements such as Chard, Crewkerne, Castle Cary, Ilminster, Langport, Martock, Milborne Port, Somerton and South Petherton could provide some development. The Plan also shows major road improvements and these are shown on Map 15. The Plan

recognizes the need to protect nature conservation interests and to safeguard valuable landscape areas, particularly the Areas of Outstanding Natural Beauty (AONB) and Special Landscape Areas (SLA). Some 60% of the Parrett Catchment area is covered by such landscape definitions and include parts of the Quantock and Blackdown Hills, the Somerset Levels and Moors, the Fivehead and North Curry ridges, the hills and vales between Milborne Port and Castle Cary with the settings of Ilminster, Chard, Crewkerne and Yeovil. (See Map 6 - Landscape). Structure Plan Policies indicate that development must take account of likely flooding problems, respect water resources, water requirements, rivers and coastlines and contain adequate infrastructures. Subject to visual and environmental criteria, water based sports involving the use of reservoirs, estuaries, rivers and waterways are permissible. Within the inland areas of the County, development of tourist facilities will be selectively encouraged.

In 1995 Somerset published a draft consultation review of the Structure Plan which addresses increased levels of development provision to 2011 considering environmental constraints, the maintenance of prosperity, enhancement of the quality of life whilst achieving sustainable objectives. Bridgwater and Yeovil remain Principal Centres which are to accept higher levels of development than other settlements. Emphasis is given to the social and economic needs of rural areas and the protection and enhancement of AONBs, SLAs, Special Landscape Features (SLFs) and the peat soils of the Levels and Moors. Draft Policies consider safeguarding water resources, floodplain protection, development in areas liable to flood, waste disposal, water based recreation, the coast and protection of the countryside. It is anticipated that the Deposit Plan will be published in the spring of 1997.

Dorset

The approved Dorset Structure Plan (2nd Alteration) (excluding South-East) 1993 identifies Sherborne as a main centre for housing and employment growth and provides for up to 850 dwellings. Allowing for completions already taken place, the current rate of construction and Local Plan allocations some 450 dwellings could be developed by 2001. New residential development in the rural settlements within the catchment is expected to be of a modest scale. The West Dorset District Local Plan (Deposit) 1994 also identifies approximately 4.0 ha for local employment needs in Sherborne. A total of some 29 ha of land could be developed between 1996 and 2001 (Table 1 Development Changes - Committed (Allocations and Other Permissions)). Final allocations are subject to change resulting from the political process. The Agency is concerned that Sherborne is situated on a major aquifer and part of the town is within Zone 1 of the Castleton Source Protection Area (see Section 7.1.11 Groundwater Quality).

The Structure Plan places emphasis upon the need for adequate infrastructure including drainage, sewerage, sewage treatment and water supply. It also indicates the need to secure improvement of water quality of rivers, lakes and streams. We will express our concerns to the Planning Authority regarding developments which could have adverse effects on water quality. Development in the countryside will need to incorporate landscape enhancement measures. In AONBs attention will be paid to conserving character and major developments will not be permitted there or

in Sites of Special Scientific Interest (SSSIs). Consideration will be given to the designation of Local Nature Reserves in all areas of high ecological value. Development in the countryside must minimize the effect on the landscape, nature conservation, water supplies etc.

Dorset County Council published the Dorset County Structure Deposit Plan for public inspection in January 1996. This sets the planning strategy for the period to 2011 and provides for further housing and employment needs. Sherborne will continue to act as a town for housing growth and provide a centre for employment, shopping and other services.

South Somerset

About half of the catchment area is within South Somerset District and had a population of 119,000 in 1991. It is predominantly an area of small communities with Yeovil (population approximately 38,000) being the main centre of population and economic activity, having a high reliance on manufacturing industry. The northern rim of the district contains The Fivehead, High Ham and Somerton escarpments. Between these and West Dorset lie extensive areas of rolling lowland and to the north the wetland landscape of the Somerset Levels and Moors. These high quality landscapes are identified as Special Landscape Areas in the Local Plans.

The South Somerset Local Plan (Draft for Consultation) 1994 is being reconsidered by the Council in the light of public responses and a requirement of the DoE to extend its scope to 2011. Outstanding residential commitments within the catchment amount to over 3,000 dwellings plus 72 ha of employment land, which should meet needs to 2001. It is anticipated that the catchment population in 2001 will be about 132,000. The Built Environment and Development Map - Map 15 shows the location of committed developments. Provisionally identified major development sites for future growth are at Yeovil, Crewkerne, Martock, Ilminster and Chard.

The Draft for Consultation placed emphasis on achieving sustainable development with policies that address the area's attractive character and features. A policy promotes the protection, conservation and enhancement of rivers, river corridors and wetlands. It is intended that the LPA will prepare a "Landscape Strategy for South Somerset" that will address important rivers and watercourses. New developments must have adequate infrastructure and not be at risk from or cause flooding.

Sedgemoor

Sedgemoor District extends on both sides of the Parrett from Bridgwater Bay to Othery. Bridgwater is one of Somerset's three principal towns. In recent years development has reflected its proximity to the M5 and in 1991 it had a population of nearly 35,000. Bridgwater serves the immediate rural area of the catchment which includes the settlements of Nether Stowey, Cannington, North Petherton and Westonzoyland. The catchment population within Sedgemoor DC in 1991 was 56,500.

The Bridgwater Area Local Plan (published 1990) was adopted in 1995. It stresses the need to safeguard the landscape character of the Quantocks AONB to the west and SLAs which include the coastal area, the Levels and Moors and the Polden Hills. Bridgwater is recognised as the main centre for development and land is allocated for housing and employment growth. Nearly 1,000 dwellings have been built in Bridgwater since 1991 and there are planning commitments for a further 3,050 which will meet needs to 2001 and probably some years beyond. Implementation is constrained by the need to construct new highways, link roads, and solving surface water and/or flooding problems. Some 71 ha of employment land is available for employment development including some 42 ha to the north of the town where surface water and flooding problems need resolution. Cannington and North Petherton contain commitments for some 340 dwellings. It is anticipated that the population within the catchment will be about 63,850 by 2001.

Taunton Deane

A strip of the catchment from the Blackdown Hills AONB in the west to the Levels and Moors is within the Taunton Deane Borough. This rural area contains a number of small settlements where only North Curry and Hatch Beauchamp have experienced any recent significant development. The 1991 population was some 3,520 and allowing for completions and the planning commitments mainly in North Curry, it could rise to about 3,700 by 2001. A small 0.5 ha site for industry is proposed at Athelney.

The East Deane Local Plan adopted 1991 safeguards the Blackdown Hills and virtually the remainder of the area as SLA for their safeguarding by strict controls upon development. The plan addresses the need for development to resolve surface water problems and for provision of adequate sewage disposal arrangements. It also recognises land drainage problems at Burrowbridge, Hatch Beauchamp, Wrantage and North Curry which will influence the location of new development.

The Borough published the "Taunton Deane Local Plan - Issues and Options Report" for the emerging Borough Local Plan, describing alternative development options for the Deane to 2006. Major development changes are not anticipated within the catchment. Plan objectives are set which include minimising pollution, protecting water interests, protection and improvement of the quality of the area's landscape and wildlife, and provision of infrastructure within development. A suggestion is for the River Tone and Burrow Mump to be designated for protection as Special Landscape Features (SLFs) and for the Levels and Moors to be a Landscape Character Area where it is to be the subject of supplementary planning guidance.

West Somerset District Area

Essentially a rural area, West Somerset District Council (WSDC) covers a small area at the north western limits of the catchment and had a population of 1,370 people in 1991. WSDC published a District Plan Consultative Report in April 1995. Development changes by 2001 are unlikely to be more than infillings within the village of Stogursey and to meet proven agricultural or other needs in the countryside. The Plan contains a comprehensive section on the water environment

with Policies relating to floodplains, groundwater and surface water protection, and the coast where the conservation of the natural coastal environment is stressed. No new development will be permitted where new coastal defences would be required. The coastal strip is defined as SLA where any development must relate to the area's character.

Mendip

Part of the rural area south of Street is included in the catchment area. Primarily an agricultural area there are no proposals for change.

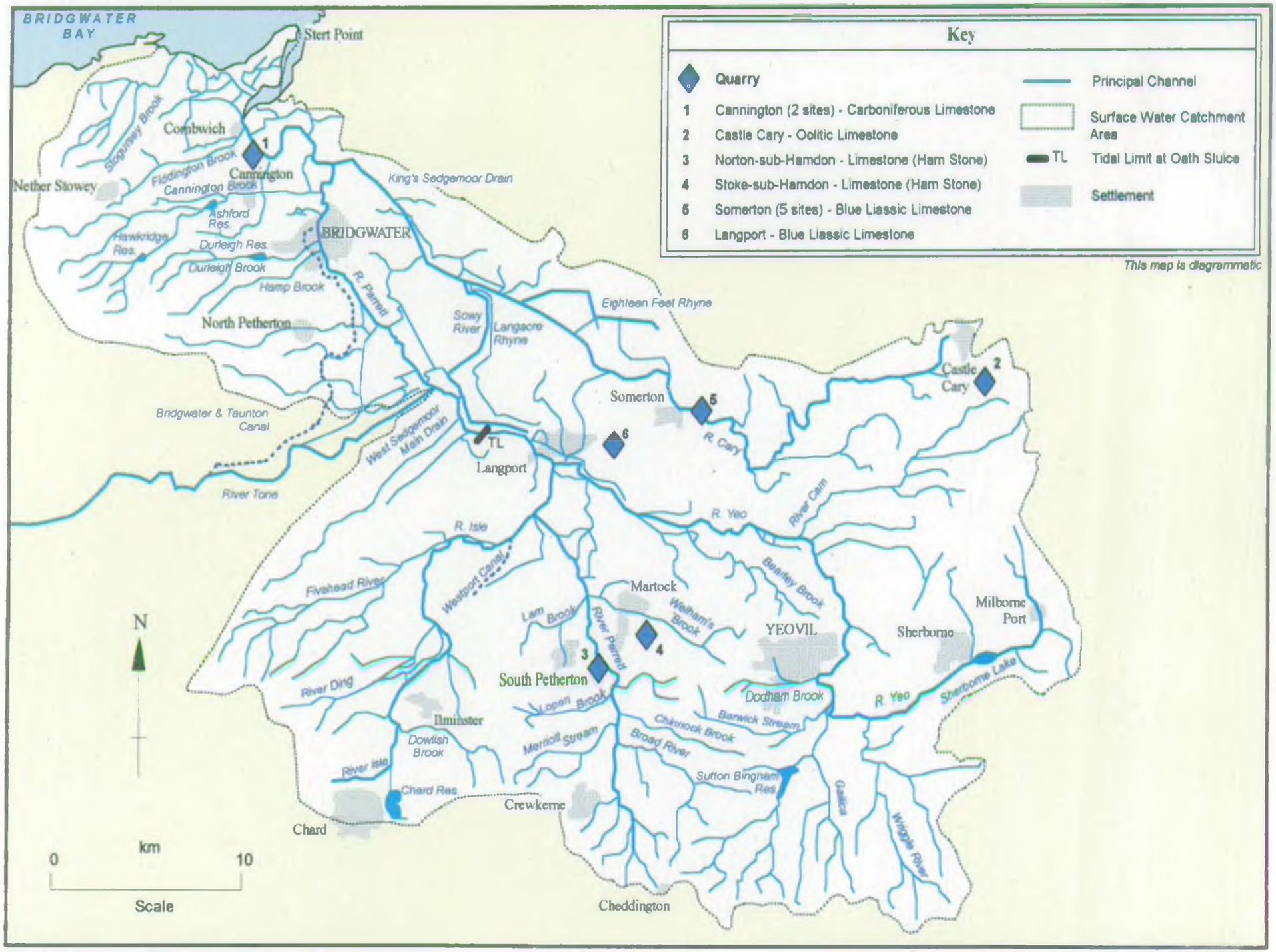
(iii) ***The Built Environment and Development Map***

Map No 15 indicates the location of the major areas and highway schemes likely to be implemented by 2001. The situation in 1996 as regards land for new development is set out in Table 1 - Development Changes - Committed (Allocations and Other Permissions).

Table 1: Development Changes - Committed (Allocations and Other Permissions)

	HOUSING			EMPLOY-MENT ha	TOTAL ha	REMARKS
	Sites	Dwell	ha			
West Dorset	Large Small TOTAL	280 350 630	11 14 25	4	29.0	Further land to be allocated to meet 2011 needs.
Sedgemoor	Large Small TOTAL	2975 825 3800	119 33 152	71.0	223.0	To meet Structure Plan 2011 needs, an additional 85 ha of residential land is likely to be allocated.
Taunton Deane Borough Council	Small	53	2	0.5	2.5	
West Somerset District Council	Small	29	1	Nil	1.0	
Mendip		Nil	Nil	Nil	Nil	
South Somerset	Large Small TOTAL	2380 810 3190	95 32 127	72.0	199.0	Further land to be allocated to meet 2011 needs.
GRAND TOTAL	Large Small	5635 2067 7702	225 82 307	147.5	454.5	

Map 16 - Mineral Extraction



This map is diagrammatic

Information correct as of December 1996

6.6 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. The damaging effects of mineral extraction are often long term and sometimes permanent. The influence of a deep quarry which removes material from below the natural water-table may extend many kilometres. Public water supplies and flows from springs that feed streams and rivers can be threatened when aquifers are either removed or disturbed.

Water is purified as it percolates through aquifers and surface layers of soil and rock. Removing these materials can degrade the quality of water in the aquifer and provide an easy route for pollution to reach groundwater.

Any water pumped from quarries is likely to be contaminated with silt and mineral salts and can seriously harm the ecosystem in the watercourse into which it is discharged.

Disused quarries present problems of after-use. Often proposals are made for land-filling with controlled waste (see Section 6.7 The Management of Waste) with further potential for pollution.

Using an abandoned quarry for industry or housing introduces a new risk of contamination to water resources. The water in a quarry lake, being surface water, is liable to eutrophication and other pollution by living organisms that were absent from the pre-quarry groundwater.

Our Objectives

To minimize the damage that mineral extraction can do to water purity and to reserves of water held in the ground. Where possible we will steer mining and quarrying operations away from important aquifers.

The Role of the Environment Agency

We have duties and powers to:

- control the quality of water discharged from mineral workings;
- prosecute offenders if they cause pollution;
- safeguard water resources.

We are involved in a range of activities:

- We monitor the changes that existing mines, quarries and pits are causing to rivers, springs, wetlands and water supplies.
- We advise planning authorities on the effects that proposals for new quarries and mines will have on water resources and the water environment. When a new mineral working is proposed that will cause harm to water resources and the water environment we will object to it.
- When needed we provide expert witnesses at public inquiries into mineral extraction proposals.

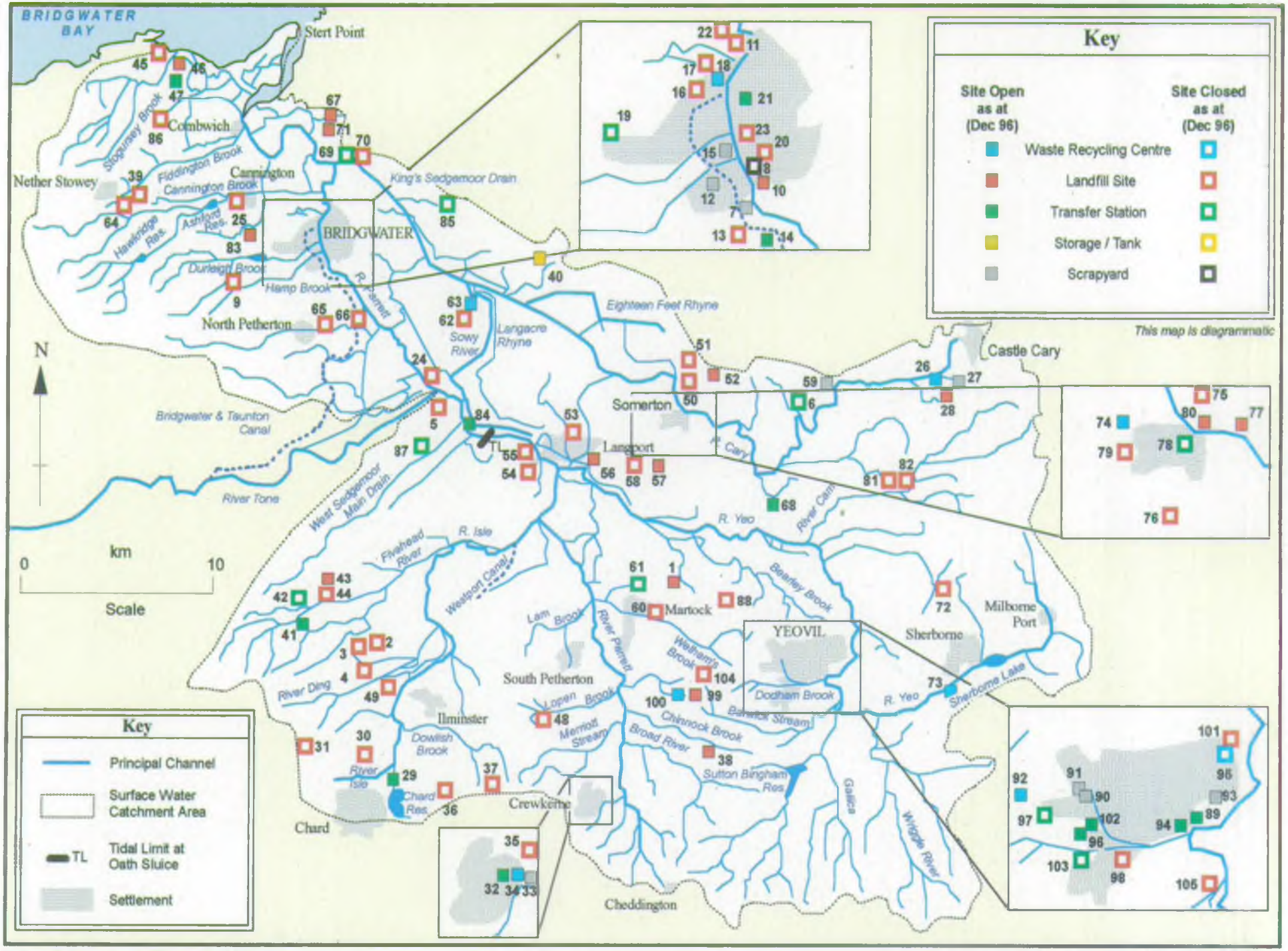
Local Perspective

Within the Parrett Catchment the sole mineral that is currently being extracted is limestone at eleven active sites. Two of these sites are to be found at Cannington where Carboniferous Limestone is being quarried. Oolitic Limestone is quarried at a site near Castle Cary. Blue Liassic Limestone is extracted from quarries near Somerton (five sites) and Langport. At Norton-sub-Hamdon and Stoke-sub-Hamdon a shelly limestone known as Ham Stone is quarried and is highly valued as it can be accurately shaped into window and door frames, wall cappings and ornamental gate posts.

There are also a number of dormant Blue Lias, Sand and Gravel, Inferior Oolite and clay sites, as well as one old Alabaster Quarry, with valid permissions to win and work minerals. Many of the clay sites have been reclaimed and redeveloped whilst most of the others are now largely naturally revegetated.

The small scale quarrying activities within the Parrett Catchment would appear to be having no major impact on water resources. Close scrutiny of any new planning applications and adherence to the principles outlined in the document "Policy and Practice for the Protection of Groundwater" will protect important resources of water.

Map 17 - Waste Management Sites



Information correct as of December 1996

INDEX TO SITES ON MAP 17

Key to Abbreviations (Waste types)

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

Open Landfill Sites

1	I	Witcombe, Ash, Martock
10	I	Dunwear Lane, Bridgwater
28	W, L, H, T	Dimmer Landfill/Special Waste Store
38	I	Broad Lane, East Chinnock
43	I	Crimson Hill Farm, Hatch Beauchamp
46	S	Hinkley Point Power Station (Adjacent STW)
52	I	Southmead Farm, Keinton Mandeville
56	I	Tengore Lane, Huish Episcopi (Oswall)
57	I	A372 (Land adjacent), Long Sutton
67	L, T, T	Walpole Drove Landfill (Wyvern Waste)
71	T, S, W	Old Brick Works, Batch Road, Puriton Drove, Puriton
77	I	Higher Hurcott Farm, Somerton
80	I	Wineberry Cottage, Littleton
83	I	Danesborough Reservoir, Spaxton Road, Bridgwater
99	H, T	Odcombe Landfill (Wyvern Waste)

Closed Landfill Sites

2	I	Ashill Road Improvement Scheme (A358 north of Ashill Farm)
3	I	Ashill Wood, Ashill, Ilminster
4	I	Sawmills, Catherine Wheel, Ashill, Ilminster
5	I	Baltmoor Cottage, East Lyng, Langport
9	S	Disused Quarry, Enmore, Bridgwater
11	I	Former Clay Pits, Chilton Trinity, Bridgwater
13	I	Huntworth Lane, Huntworth, Bridgwater
16	I	Saltlands Avenue, Bridgwater
17	H, T	Saltlands, Bridgwater
20	I	Summerway Cottage, East Bower, Bridgwater
22	I	The Poplars, Chilton Trinity, Bridgwater
23	I	Westonzoyland Old Road, Bridgwater
24	I	The Poplars, Stathe Road, Burrowbridge
25	I	Manor Farm, Cannington (Bypass spoil)
30	I	Four Lanes, Combe St Nicholas
31	I	Stoopers Hill, Combe St Nicholas, Chard
35	I	Lower Easthams Farm, Yeovil Road, Crewkerne

Closed Landfill Sites continued

36	I	Cudworth, Chard
37	I	Higher Chillington, Windwhistle, Chard
39	S	Marsh Mills Road, Fiddington, Bridgwater
44	I	Railway Cutting, Station Road, Hatch Beauchamp, Taunton
45	S	Hinkley Point Power Station (Adjacent Hinkley Break)
48	I	The Old Mill House, Hinton St George, Crewkerne
49	I	Ashill Road Improvement Scheme (A358 east of Bow Bridge)
50	I	Adjacent St Marys Church, Keinton Mandeville, Somerton
51	S	Church Street, Keinton Mandeville
53	I	Culver Hill, Pitney
54	I	Park Quarry, Park Lane, Huish Episcopi, Langport
55	I	Portfield Lane, Huish Episcopi, Langport
58	I	Disused quarry, Long Sutton, Langport
60	S	Bearley Bridge, Martock
62	I	Cudleigh Pit, Middlezoy
64	I	Halsey Cross Farm, Over Stowey, Bridgwater
65	I	Broadlands Avenue, North Petherton
66	I	Reeds Farm, Fordgate
70	I	Puriton Park, Puriton
72	T	Great Pit Lane, Sandford Orcas, Sherborne
75	I	Charity Farm, Littleton, Somerton
76	I	Highbrooks Quarry, Watts Quarry Lane, Somerton
79	H, T	Whiscombe Hill, Somerton (YPH Ltd) (Landfill/CAS)
81	I	Camel Hill Farm, Queen Camel
82	I	Hazelgrove Park, Sparkford
86	T, S	Disused quarry. Claylands Corner, Stogursey
88	I	South of A303, Queen Street, Tintinhull, Yeovil
98	I	Lysander Road, Yeovil
101	T, H	Sunningdale, (Landfill) Great Lyde Road, Yeovil
103	S	Watercombe Park, Yeovil
104	S	Woodhouse Farm, Montacute
105	T	Yeovil Junction Station, Yeovil

Open Transfer Sites

14	S	Huntworth M5 Depot, Huntworth, Bridgwater
21	H, T, S, I	The Drove, Bridgwater (S Roberts TS)
29	H, T	Chaffcombe Road, Chaffcombe, Chard
32	I	Blacknell Lane, Crewkerne
41	I	Bickenhall Lane, Hatch Beauchamp, Taunton
47	W, S	Hinkley Point Power Station (Asbestos)
68	I	Podimore, Ilchester
84	S	Willow Farm, Stathe
89	L	STW Yeovil
94	I	Flushing Meadow, Pen Mill, Yeovil (TS)
96	H, T	Higher Farm TE, Preston Plucknett, Yeovil (Skip TS)
102	T	The Abbey, Preston Road, (YPH Plant Hire Ltd)

Closed Transfer Sites

6	S	Steart, Babcary, Somerton
19	S	Skimmerton Lane, Bridgwater
42	S	Capland, Hatch Beaumont, Taunton
61	S	Martock Depot, Martock
69	S	Dunball Depot, Puriton, Bridgwater
78	S	Somerton Depot, Somerton
85	S	Stawell Road, Stawell
87	S	Huntham Lane, Stoke St Gregory
97	H	Lufton Depot, Artillery Road, Yeovil (Can Store)

Open Waste Recycling Centres (WRC)

18	H, T	Saltlands, Chilton Trinity, Bridgwater (SCC WRC)
26	H	Dimmer Camp, Castle Cary
34	H	Blacknell Lane, Crewkerne (SCC WRC)
63	H	Greylake (west of) Middlezoy (SCC WRC)
73	H	West Mill Lane, Sherborne, Dorset
74	H	Bancombe Road IE, Somerton (SCC WRC)
92	H	Brympton WRC, Lufton Trading Estate, Yeovil
100	H	Odcombe WRC (Wyvern Waste)

Closed Waste Recycling Centres

95	H	Great Lyde Road, Yeovil

Open Scrapyard

7	L, T	Axe Road, Bridgwater, (Maesbury scrapyard)
12	L, T	Hamp Yard, Bridgwater (Hodge scrapyard)
15	T	Phoenix Road, Bridgwater (R Johnson scrapyard)
27	T, L	Dimmer Camp, Castle Cary
33	L, T	Blacknell Lane, Crewkerne (Hallet Metals scrapyard)
59	L, T	Cross Keys, Lydford-On-Fosse
90	L, T	Abbey TE, Yeovil (scrap cars)
91	T	Abbey TE, Yeovil (scrap metals)
93	T	Buckland Road, Penmill, Yeovil

Closed Scrapyard

8	T	Colley Lane IE, Bridgwater (Aybiis Autos scrapyard)

Open Storage/Tank

40	L	Coates Farm, Greinton

6.7 THE MANAGEMENT OF WASTE

Here we consider the management of wastes. Certain wastes are not the responsibility of the Environment Agency, most notably mines and quarry waste, and agricultural waste.

This management may include: storage; treatment (including recycling); processing or disposal facilities such as landfill and the spreading of waste on land.

In common with a number of North European countries the United Kingdom is committed to achieving more sustainable waste management practices. The Government's strategy for sustainable waste management for England and Wales has been set out in a White Paper "Making Waste Work", published December 1995. We cannot entirely eliminate waste production but we can reduce the impact that our waste has on our environment. The different waste management options can be ranked in a hierarchy that gives some idea of the relative sustainability of each. The waste hierarchy is shown below:

- REDUCTION
- RE-USE
- RECOVERY Recycling, Composting, Energy
- DISPOSAL

The policies and initiatives set out in the Paper are aimed at moving our management of waste further up this waste hierarchy.

The Environment Agency strongly supports the philosophy behind the Government's strategy and will play a key role in achieving more sustainable waste management. The Agency's role of delivering waste regulation, carrying out research and providing information and guidance on handling waste will be of particular importance.

Government initiatives to move waste management up the hierarchy include legislative as well as financial incentives. Mechanisms already in place include the implementation of much tighter waste licensing regulations which include a charging scheme favouring recovery facilities resulting in recovery operations becoming more viable; provision of Recycling Credits for Household Wastes and the requirement on local authorities to draw up Recycling Plans to detail how the Government's target of recycling 25% of household waste by the year 2000 is to be achieved. Further mechanisms include the Landfill Tax - October 1996 and producer responsibility for packaging waste legislation - Spring 1997. The deadline for obligated companies to register and provide data on the types and quantity of packaging handled is planned to be 31 August 1997. Such are designed to drive a strategy based on the hierarchy. Landfill will however remain as a method of solid waste disposal in the UK for wastes that cannot be minimised further or recovered and for the residue of some recovery methods such as incineration with energy recovery.

Waste Management Licensing

A new waste management facility will normally require planning permission from the Local Planning Authority followed by a Waste Management Licence (WML) from the Environment Agency. Under the new WML Regulations a licence can no longer be simply handed back once the holder has finished with it. To surrender responsibility of the site a licence holder must first obtain a "Certificate of Completion" from the Environment Agency

which is only issued once it is satisfied that the site no longer poses a threat to the environment or harm to human health.

A number of waste management activities are exempted by statute from the requirements for licensing. There are currently 45 exempted activities which include the spreading of industrial waste on land for beneficial purposes, certain small to medium sized scrap yards and a range of construction and recycling activities. Although not subject to full licensing, 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. Land spreading, for example, is not considered to be a waste disposal option as the land must gain benefit from the waste material; the process is therefore strictly controlled by the Environment Agency to ensure environmental benefit. Exempted activities registered by the Environment Agency are inspected to ensure that they continue to be exempt. Information in the register 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.

Landfill Wastes

Any method of waste management has the potential to impact on the environment; landfill is no exception for two reasons:

1 The waste may degrade to form a polluting liquid known as leachate, which is a threat to both surface and groundwater. Groundwater is particularly vulnerable, due largely to the practice of infilling mineral excavations, especially those in aquifers such as limestone or chalk.

2 The waste may degrade to produce "landfill gas" - a variable mixture of gases containing methane, which can cause explosions and which is also a "greenhouse gas".

However, landfill sites are now designed and engineered to be able to cope with the resulting pollutants. Systems and controls such as site licensing, inspections and monitoring by the Environment Agency are in place to minimise any risks. Stringent licensing conditions and regular site inspections control potential operational problems such as noise, dust, odour, litter and general unsightliness at facilities.

The Role of the Environment Agency

We have duties and powers to:

- Licence waste management facilities and register exempt facilities.
- Ensure new facilities have minimal adverse environmental impact by including conditions and setting standards of operation within the WML and ensure only technically competent people run the facilities.

- Ensure that site operators make plans to monitor for changes in the quality of ground and surface waters and for the presence of landfill gas in and outside of landfills.
- Ensure that sites are maintained and operated properly in line with licence conditions by means of regular inspections.
- Take enforcement action to prevent or control pollution occurring from a licensed site or where waste has been handled or disposed of illegally.
- Control the import and export of wastes.
- Provide information for developments close to landfills..
- Audit the operator's environmental monitoring programmes.
- Control the movement of Special Waste (i.e. hazardous waste).
- Conduct waste arisings surveys and provide statistics for the statutory National Waste Strategy.
- Register waste carriers and waste brokers.
- Provide advice and guidance on waste management issues to interested parties and maintain Public Registers.

Local Perspective

The catchment boundary does not conform to District Council boundaries so 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 1994/95 with the Districts of South Somerset and Sedgemoor most closely fitting the Parrett Catchment Area. The arisings are as follows:

Table 2: Waste Arisings

WASTE TYPE	WASTES ARISINGS TONNES PER YEAR	
	SEDGEMOOR DC	SOUTH SOMERSET DC
Household	45,000	59,000
Commercial	62,000	94,000
Industrial	414,000	554,000
TOTAL	521,000	707,000

There are 46 operational licensed waste management facilities within the catchment, and 67 closed licensed facilities. (See Map 17 - Waste Management Sites).

Within the catchment there are three major household/commercial/industrial waste landfill facilities licensed to Wyvern Waste Services Ltd., the County's Local Authority Waste Disposal Company:

Dimmer Landfill (WML/17.2 ST 614311) near Castle Cary receives approximately 100,000 tonnes of waste annually. The site is underlain by Lias Clay and operated on a containment basis with leachate extraction and onsite treatment prior to consented disposal to the local

watercourse. Discounting a potential extension area, the site is due for completion in approximately 2002.

Walpole Drove (WML/157.2 ST 312429) near Pawlett, Bridgwater is similar to Dimmer in that the site is operated on a containment basis, with treated leachate being discharged under consent into the River Parrett. The site in underlain by Lias Clay which provides the natural containment to landfilling operations at surface. The site accepts approximately 150,000 tonnes of waste each year and is expected to be completed by 2015.

Odcombe (WML/39.2, ST 495147) near Yeovil is currently being restored with a low permeability cover in the upper levels of the site, which is likely to be completed in early 1996. The site has been historically operated on dilute and disperse principles. However recent improvements in leachate management at the site has led to limited collection with 'on-site' treatment by adjacent grass plot spray irrigation. Treated leachate is returned to adjacent surface watercourses under consent from the Environment Agency. Improvements in surface water management are ongoing at the site.

Three closed landfill sites (Saltlands, Whiscombe Hill and Sunningdale) are recorded as having historically accepted household wastes with leachate management being undertaken on 'dilute and disperse' principles. One other landfill site in the catchment has accepted commercial wastes the remainder of the landfills are or were licensed for inert or construction/demolition wastes.

The 12 operational transfer stations, 9 scrapyards and 8 waste recycling centres currently handle a wide range of wastes. Two sewage treatment works at Yeovil are also licensed for the treatment of industrial sludges and liquids.

Agricultural land in the catchment is extensively used for the disposal of various industrial waste liquids and sludges (such as blood, septic tank wastes and milk wastes) and sewage sludge from Wessex Water Services Ltd sewage treatment works. We assess the environmental impact of applying waste to land.

Strategic aspects of waste disposal in the catchment will be defined in plans prepared by Somerset County Council. The 'Draft for Consultation' of the Waste Local Plan, which deals with geographical, population and planning issues, is proposed to be published for Autumn 1997. The County Council's Waste Disposal Authority together with the five District Councils have produced a "Waste Management Strategy for Somerset" which deals with the future management of household waste and will be issued for public consultation during Spring 1996. Finally the "Waste Survey Document" which deals with such matters as waste arisings and available capacity, was issued by Somerset County Council in the summer 1996.

6.8 CONTAMINATED LAND

Contaminated land is land that could be a hazard to health or cause pollution, for example derelict or existing factory sites or disused waste disposal sites. We are concerned about the water pollution risks from contaminated land.

Our Objective

To prevent the pollution of ground and surface water from contaminated land.

The Role of the Environment Agency

The Environment Act 1995 contains new provisions for dealing with contaminated land. These 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 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. Each local authority 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 national 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. Until these new powers come into force, and in many cases after, contaminated sites will continue to be addressed through planning conditions and existing pollution legislation. Until these new provisions are enacted, the Agency can:

- comment on planning applications and give advice on the best way to redevelop sites;
- help to identify contaminated areas;
- help to ensure that the worst sites are targeted for redevelopment and clean-up plans prepared;
- take enforcement action if contaminated land is causing pollution.

Local Perspective

The precise nature and full extent of contaminated land within any catchment is difficult to accurately define, since the contamination of many sites is only realised when they are redeveloped, or when pollution actually occurs.

All open and closed non-inert landfill sites are by definition contaminated sites, but other waste management activities may have the potential to cause contamination (see Section 6.7 - The Management of Waste).

The other main potential cause of contamination within the catchment is industry, which is concentrated largely in Bridgwater and Yeovil. However, it should not be forgotten that a large number of activities have the potential to cause contamination; for example agriculture, petrol filling stations or even the use of domestic heating oil storage.

Sites of coal gas manufacture can be heavily contaminated with a wide range of polluting substances. These sites can therefore present a high risk to the water environment.

6.9 FARMING

Over 80% of the land in England and Wales is farm land. The way this land is used affects the quality of the environment. We are concerned about the pollution of surface and groundwaters from animal wastes, fertilizers and pesticides. Soil erosion, land drainage and stock damage to river banks can also lead to problems. A sustainable farming system that conserves the soil and minimizes and recycles wastes will reduce the risk of damage to the environment.

Our Objectives

To protect the environment from potentially damaging farming activities and to encourage agricultural practices that improve the water environment.

The Role of the Environment Agency

There are only a limited number of ways we can influence how farmers use land. Other agencies such as the Ministry of Agriculture, Fisheries and Food (MAFF) can encourage sensitive farming practices using financial incentives which are required to control diffuse pollution. However we can control and prevent polluting direct discharges to controlled waters in the same way as we do with any other industry.

We have duties and powers to:

- prevent and control pollution;
- deal with pollution incidents;
- issue consents to discharge from farms. However we encourage farmers to dispose of farm wastes to land rather than discharging treated waste directly to rivers;
- regulate the abstraction of water for use on farms;
- supervise matters relating to flood defence.

Our work involves a range of activities:

- We assess the impact of farming on water quality, prioritizing our work where there are gaps in our knowledge.
- We promote the designation of water protection zones and stopping certain activities within them. Nitrate Sensitive Areas (NSAs) and Nitrate Vulnerable Zones (NVZs) are examples of this (see Glossary - Appendix 2).
- We target our pollution prevention work where it is needed most.
- We inspect farms so that pollution can be prevented.
- We are developing best practices to prevent pollution from the storage and disposal of farm wastes, and from the management of farm land. These best practices will include things like buffer strips or other schemes to reduce pollution and improve rivers and wetlands for wildlife.
- We educate farmers and the public about the pollution problems caused by farming.
- We work with other agencies such as MAFF to make the most of our pollution prevention work.
- We control certain works which may affect rivers.
- We are developing Water Level Management Plans for environmentally important sites on main river.

- We provide flood warning to mitigate damage to property and risks to stock.

Local Perspective

The Parrett Catchment is predominantly agricultural with over 93% of land devoted to agriculture compared with the national figure of just over 80%.

Of the total 107,600 ha of agricultural land the predominant land use is grassland/grazing (63%). Arable and fallow (30%) is the next largest type (see Table 3 - Land Use Type).

Table 3: Land Use Type

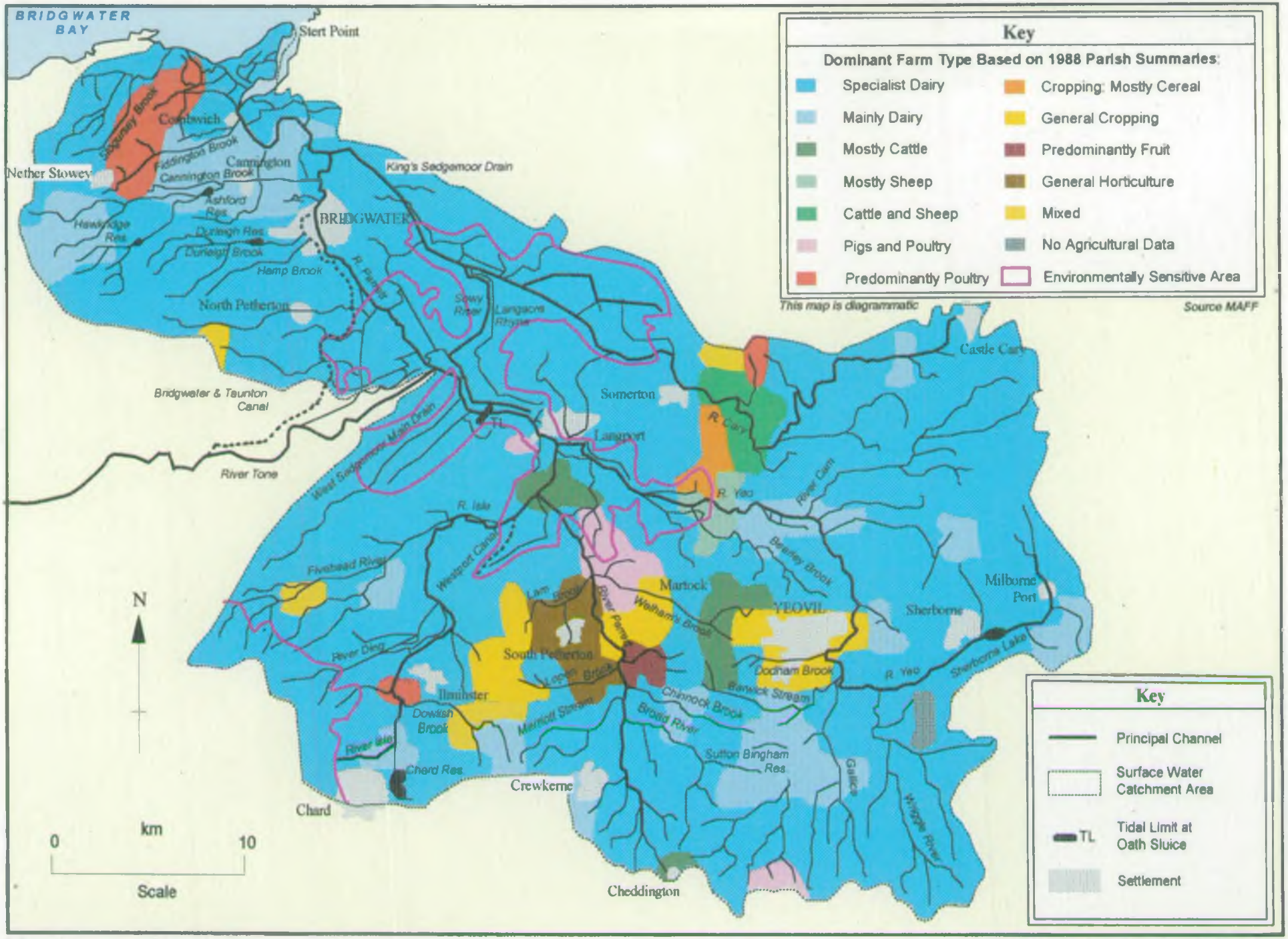
Land Use Type	%
Grassland > 5 years old	48.3
Grassland < 5 years old	13.0
Rough grazing	1.8
Arable and fallow	29.6
Farm woodland	1.5
Set aside	4.4
Other land	1.5

The catchment has 87% of agricultural land in the three highest Grades (Grades 1-3) compared with the national figure of 60%, which indicates the importance of the catchment for agriculture and enables higher stocking and cropping levels than average. There is comparatively little farm woodland.

The distribution of farm types reflects the distribution of the different qualities of farmland (for the distribution of dominant farm types see Map 18 - Farming).

The catchment is predominantly Grade 3 (grassland which supports mainly specialist dairy farming with some arable). The steeper slopes of the Blackdowns, Quantocks and limestone ridges support most of the woodland found within the catchment with mainly permanent pasture lower down the hillsides. Fertile Grade 1 (excellent) and Grade 2 land is concentrated between: Ilminster and Sherborne; to the south of Castle Cary; and south and west of Bridgwater, where arable farming predominates. Higher land around the edges of the Moors tends to have a higher proportion of arable fields as do some pump-drained Moors e.g. Aller, Wick, Witcombe Bottom and Kingsmoor. The peat Moors are Grade 2 (e.g. West Sedgemoor, King's Sedgemoor, North Moor) whereas the clay Moors (e.g. Wet Moor, West Moor, Aller Moor) constitute the main areas of Grade 4 land within the catchment. The Moors have been highly modified by embanked rivers, drainage schemes and often pumped drainage to enable more intensive agriculture e.g. improved grassland for silage; and arable crops, especially maize for fodder.

Map 18 - Farming



Information correct as of December 1996

The Moors form part of the Somerset Levels and Moors Environmentally Sensitive Area (ESA) where traditional farming practices have helped to create or protect distinctive landscapes, wildlife habitats or historic features. The purpose of the scheme is to support the continuation of these practices and to encourage measures that will enhance the environment.

There are two ESAs within the catchment - the Somerset Levels and Moors and part of the Blackdown Hills ESA (see Map 18 - Farming). The lower lying Moors are subject to regular winter flooding, and the soils are affected by high winter groundwater levels making them most suited to permanent grassland but with some cereals where the flood risk is low.

Under the scheme MAFF offer three tiers of payments, over a period of ten years, for the adoption of prescribed less intensive farming practices leading to increasing levels of environmental benefit. In this ESA the management agreements include conditions of maintained or raised water levels. There is also a 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 8.5% over the period 1984-94. Within the arable sector there has been a decline in cereal growing with a 4.5% increase in potatoes and sugar beet, both crops which are most likely to benefit from spray irrigation. Within the otherc Crops sector there has been a large increase in the growing of maize for cattle feed. This crop is capable of absorbing large amounts of organic manure provided that the application rates and timing are in accordance with the Codes of Good Agricultural Practice for Soil and Water.

Farm problems

The following types of problem are likely to occur either chronically or occasionally:

- Soil erosion - from sloping cultivated fields, particularly after ploughing and on sloping land in periods of intense rainfall. This increases the silt loading of the river and can lead to problems with the concretion of river bed gravels, the reduction of light for river plants and deleterious effects on fish and invertebrates. Soil erosion is increased by hedge removal which often accompanies arable farming.

  Under the Countryside Stewardship Scheme and the proposed MAFF Habitat Scheme, payments may be available to manage waterside land in a way sympathetic to wildlife. However, this scheme is restricted to very small areas and is not relevant to the greater part of arable farming. Set-aside land can also provide some temporary environmental benefit (see Sections 6.1 Landscape, Wildlife and Archaeology and 7.3 Flood Defence and Conservation).

- Runoff from riverside fields, especially after ploughing and fertilizer application, often contains high levels of plant nutrients, particularly nitrate and phosphate. This may give rise to nutrient enrichment in the watercourse, leading to excessive plant growth and more frequent algal blooms (eutrophication). The creation of uncultivated strips of land next to the river - buffer strips - can help to reduce the amount of silt and fertilizer runoff entering the watercourse. We have recently published a booklet called "Understanding Buffer Strips". It explains types of buffer, their benefits and role in reducing pollution.

- Arable farming often requires spray irrigation which depletes surface water resources in the summer months when river flows are likely to be low.

- Groundwater may be polluted by fertilizer or pesticides at those farms which overly aquifers.

- Habitat loss is often a result of intensive farming e.g. by the removal of hedgerows, ploughing up to the river banks and removal of scrub vegetation.

- Pesticides - arable cultivation often involves ploughing right to the river bank top, and the flailing of bankside vegetation. The lack of a buffer strip between arable land and watercourse can lead to pesticide residues being washed into rivers. Chemicals such as atrazine are commonly used on maize and are known to cause environmental problems in other parts of the country, but not as yet in this catchment (see Section 7.1.2 EC Dangerous Substances Directive).

- Livestock farms can be a source of pollution or silage. However, recent investment in waste storage and handling techniques, largely supported by MAFF grant aid, has caused a significant reduction in the number of point source polluting discharges. This grant aid has now ceased and this is likely to affect future improvement on farms where no such investment was made.

Environment Agency and MAFF officers give free advice to farmers on the production of Farm Waste Management Plans, but with the withdrawal of grant aid for pollution control other than in NSAs/NVZs (see Section 7.1.10 Groundwater Quality) it may prove difficult to encourage farmers to invest in such non-income generating capital works. The Agency shares the concern of English Nature that as a result waste may be spread on unimproved and semi-improved pasture of wildlife interest. Farmers are also encouraged to follow advice published in the free MAFF Codes of Good Agricultural Practice for the Protection of Water, Soil and Air. Where farm pollution is known to have caused non-compliance with River Quality Objectives this is dealt with in Section 7.1 Water Quality - Targets, State of the Environment and Issues.

6.10 FORESTRY

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

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

Our Objective

To protect the water environment from the negative effects of forestry activities and to encourage forestry practices that improve the water environment.

The Role of the Environment Agency

We have duties and powers to:

- regulate some forestry works using land drainage legislation;
- deal with pollution incidents.

Our work involves a range of activities:

- We work with the Forestry Authority and local authorities to ensure that the most significant forestry schemes consider effects on the water environment. We welcome the opportunity to comment on these schemes and on Indicative Forestry Strategies where they are being developed.
- We identify areas that might be sensitive to the planting of forests to the Forestry Authority, Forest Enterprise and local authorities.
- Significant planting within the 'main river' floodplain needs the consent of the Environment Agency under land drainage byelaws. With the Forestry Authority we are looking at the prospects for new floodplain woodlands in the lowlands of England and Wales and considering their potential impact on flood storage.
- We are promoting the Forest and Water Guidelines with Environment Agency staff and developing 'best practice' techniques further through our research and development programme.
- We are working with the Forestry Authority to improve the way we consider the environmental impact of proposed forestry schemes. At the moment only new planting schemes require an Environmental Impact Assessment but large scale woodland management activities can cause as much damage to the water environment as new planting schemes.

Local Perspective

There is comparatively little woodland within the catchment and most of that is concentrated on the steep slopes of the Blackdown Hills, the Quantocks and the limestone hills of north west Dorset. Other woodland occurs largely on higher ground such as the Polden Hills and the ridge south of West Sedgemoor. There is little woodland in the floodplains of rivers, but in the Somerset Levels and Moors pollarded willows along the river margins are a characteristic feature. (See Map 19 - Forestry).

The Blackdown Hills and Quantock forests plus Copley Wood north east of Somerton are managed by Forest Enterprise. The remaining woodland is privately managed. Future forestry development within the catchment is unlikely to be significant.

There are no acid sensitive areas in the catchment and acidification is not considered to be a problem. Forests and forestry operations do not generally impact upon the water environment in this catchment.

MAFF statistics show that in 1994 only 1.5% of farmland in the catchment was farm woodland, an increase of only 0.3% since 1984. Waterside trees and woodland can be beneficial to landscape, wildlife and as part of buffer strips alongside rivers to reduce the impact of agriculture. (See Farming, Section 6.9).

Help is available to riparian owners and farmers:

- The Forestry Authority can support with grant aid the establishment of broad-leaved copses by riparian owners in accordance with the "Forest and Water Guidelines". (See Appendix 1 - Publications, No. 24). *(Note that the Forestry Authority point out that felling as part of a management programme (e.g. re-coppicing mature trees) may require a Felling Licence).*

- The proposed MAFF Habitat Scheme provides incentives to create buffer strips alongside watercourses and by taking land out of agricultural production for twenty years.

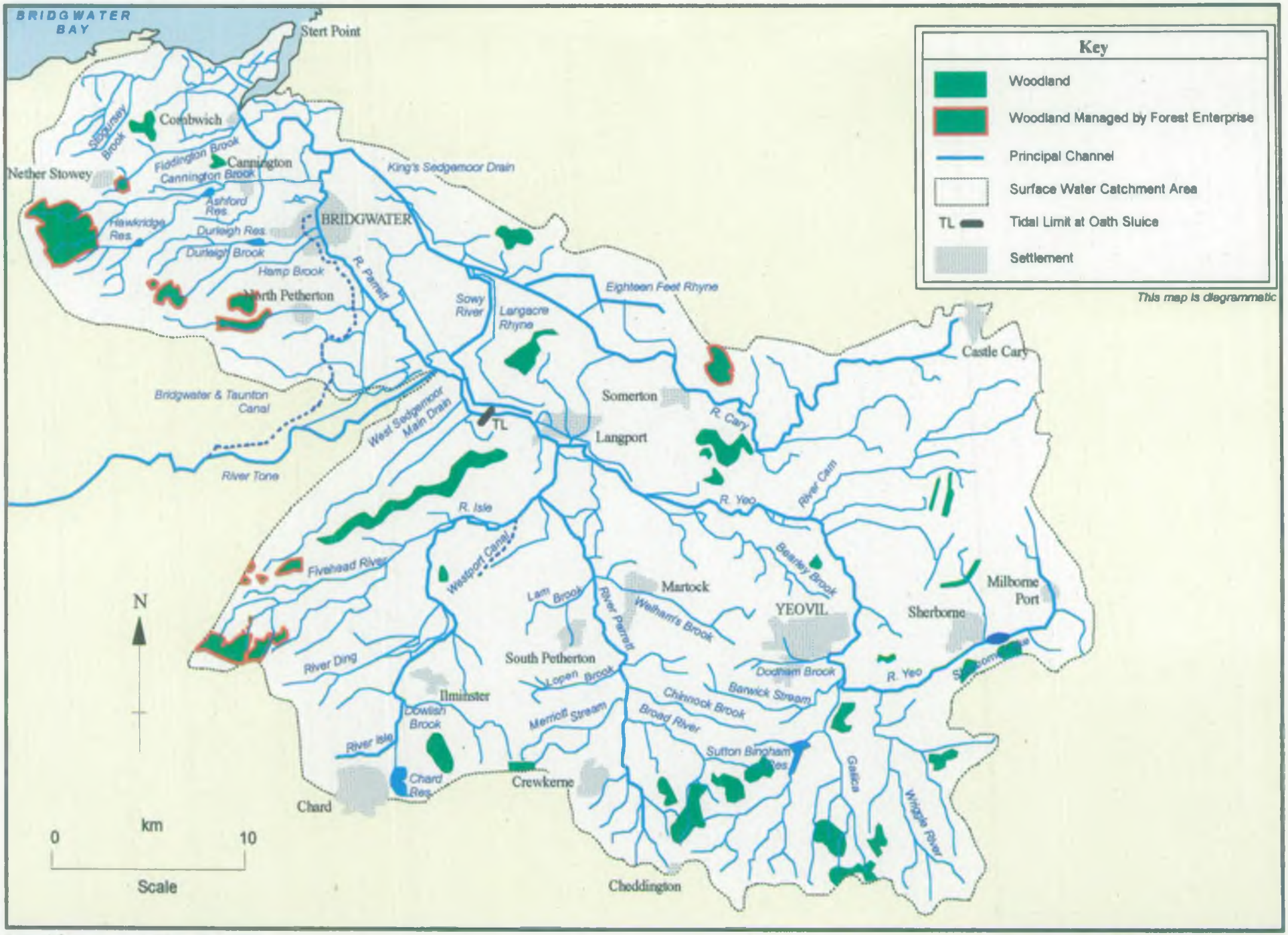
- The MAFF Farm Woodland Premium Scheme also encourages the creation of new woodland on farms.

- Arable land taken out of production under forestry schemes may also count towards farmers' set-aside requirements under the Arable Area Payments Scheme.

- The MAFF Environmentally Sensitive Area Scheme (ESA) provides compensatory payments under a management agreement to farmers who manage land in ways which protect and enhance landscape, wildlife and historic features.

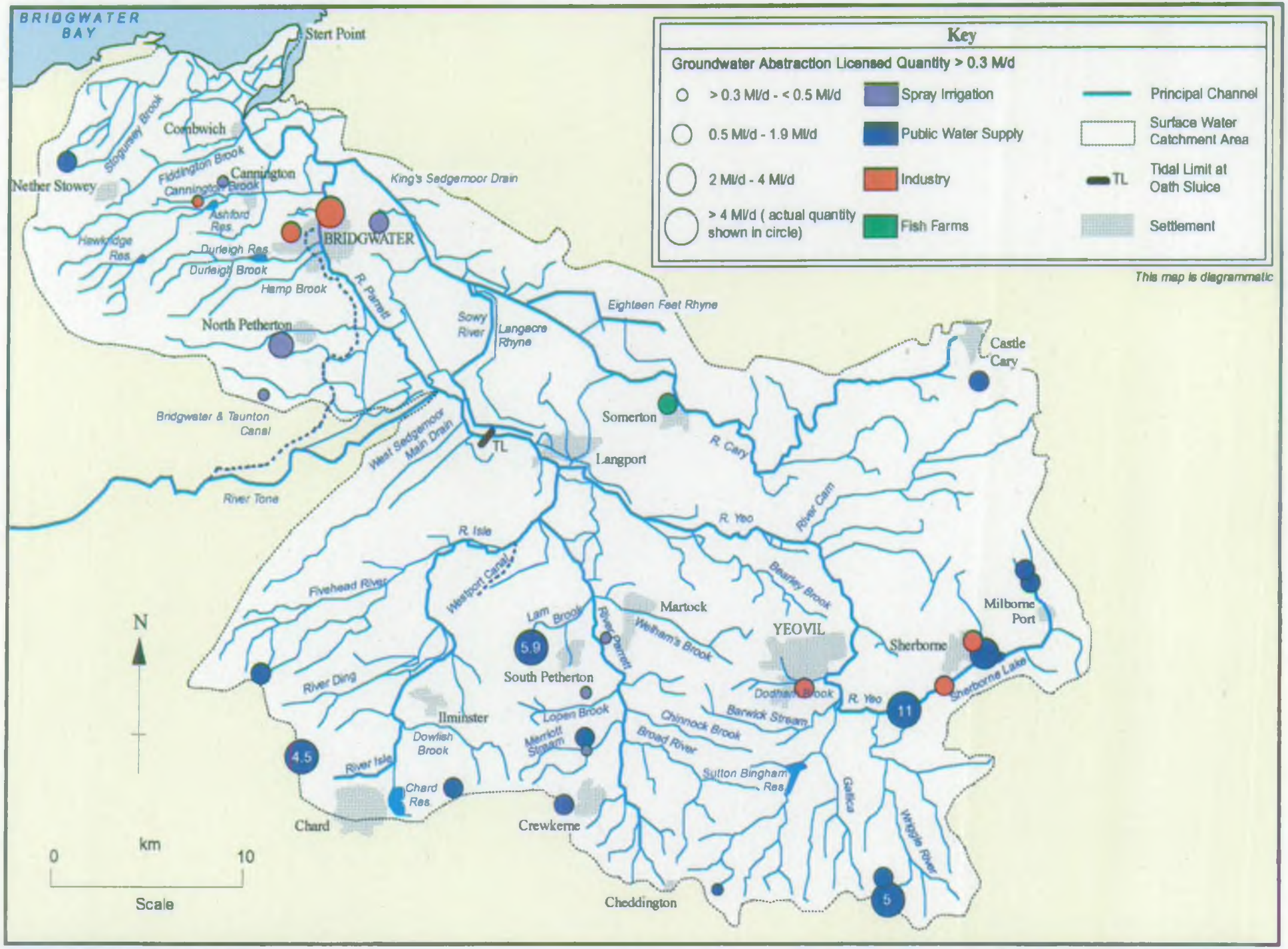
  There are two ESAs in the catchment and the part of the Blackdown Hills ESA within the catchment is largely forest.

Map 19 - Forestry



Information correct as of December 1996

Map 20 - Groundwater Abstractions



Information correct as of December 1996

6.11 WATER ABSTRACTION AND SUPPLY

Here we consider the abstraction of water from the surface or below the ground for public water supply, industry, and other uses such as spray irrigation. Our document "Regional Water Resources Development Strategy - Tomorrow's Water" has provided the technical water resources information in this Plan.

Our Objective

To manage water resources to achieve the right balance between the needs of the environment and those of the abstractors.

The Role of the Environment Agency

Our management of water resources is guided by European Union and UK legislation. We have duties and powers to:

- ensure water is used properly, regulating abstractions using licences;
- conserve water supplies and protect them from over use.

Our work involves a range of activities:

- We enforce abstraction licence conditions to protect the water environment and the rights of other abstractors.
- We are working on a system for mapping the availability of groundwater.
- We are developing and implementing a consistent approach to determining licences.
- We are working on ways of defining acceptable river flows to help us determine licences.
- We support selective domestic metering where resources are stressed.
- We define groundwater protection zones and publish groundwater vulnerability maps to protect resources from development and pollution risks.

Local Perspective

On average the total volume of water available in the Parrett Catchment is some 425,000 megalitres per year (Ml/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. Man puts demands on this water resource via abstraction.

Water is abstracted within the Parrett Catchment for public water supply and for private water use. The latter includes the supply of water for industrial use, agriculture, fish farming and amenity purposes. In addition, some remote parts of the catchment rely on water supplied from private abstractions rather than mains water. All the public water supply abstractions and many of the private abstractions are licensed.

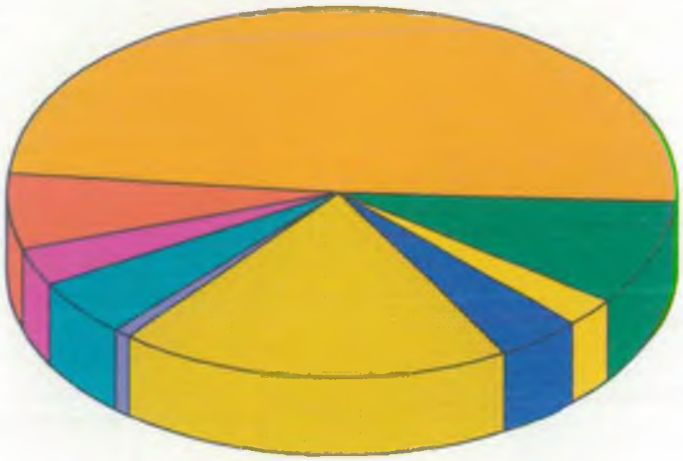
The licensed abstractions in the catchment are summarised in Table 4 - Authorized Abstractions in the Parrett Catchment.

Table 4: Authorized Abstractions in the Parrett Catchment

Ground	Number of licences (as of 17/10/95)	Volume Megalitres per day - (Annual authorized volume ÷ 365)	Percentage of total	Proportion consumed (%)
General farming	402	3.15	7.24	25
Spray irrigation	23	0.64	1.47	100
Private water supply	21	0.44	1.01	25
Industry	20	6.78	15.57	30
Other agriculture	7	0.11	0.25	25
Fish farming	3	0.98	2.26	0
Public water supply	15	31.30	71.89	100
Commercial	3	0.13	0.29	30
Leisure	2	0.01	0.03	30
Total	**496**	**43.53**	**100.01**	

Surface	Number of licences	Volume Megalitres per day - (Annual authorized volume ÷ 365)	Percentage of total	Proportion consumed (%)
General farming	11	0.15	0.13	25
Spray irrigation	59	1.96	1.75	100
Private water supply	4	0.07	0.06	25
Industry	8	5.69	5.09	30
Other agriculture	3	0.24	0.22	25
Fish farming	6	26.65	23.81	0
Public water supply	5	75.05	67.03	100
Commercial	1	0.02	0.01	30
Leisure	23	2.13	1.91	30
Total	**120**	**111.96**	**100.01**	

Figure 1

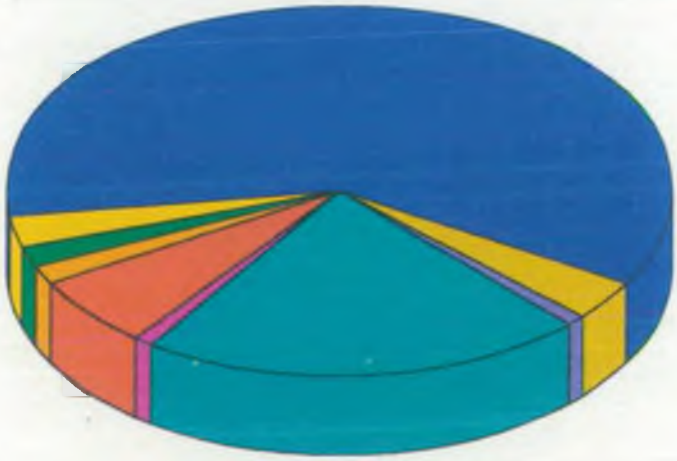


Number of Licences
Surface Water

Total Number of Licences 120

Public Water Supply 5	Other Agriculture 3	General Farming 11	Spray Irrigation 59	Industrial 8
Private Water Supply 4	Fish Farming 6	Commercial 1	Leisure 23	

Figure 2



Surface Water
% of Abstractions

Total Licensed Quantity = 111.97 Ml/day

Public Water Supply 67.03%	Other Agriculture 0.22%	General Farming 0.13%	Spray Irrigation 1.75%	Industrial 5.09%
Private Water Supply 0.06%	Fish Farming 23.81%	Commercial 0.01%	Leisure 1.91%	

Information correct as of 1996

Figure 3

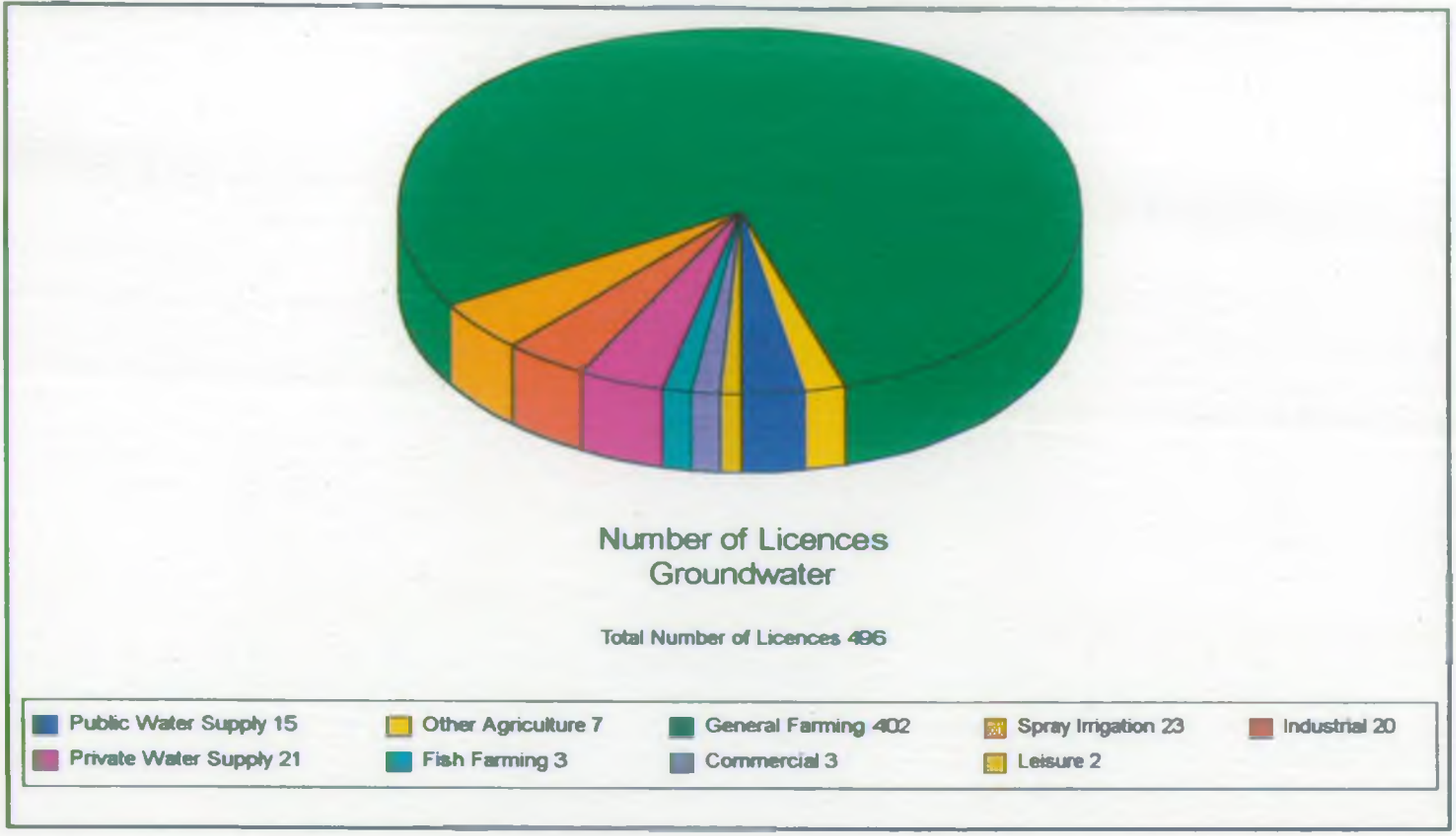


Figure 4

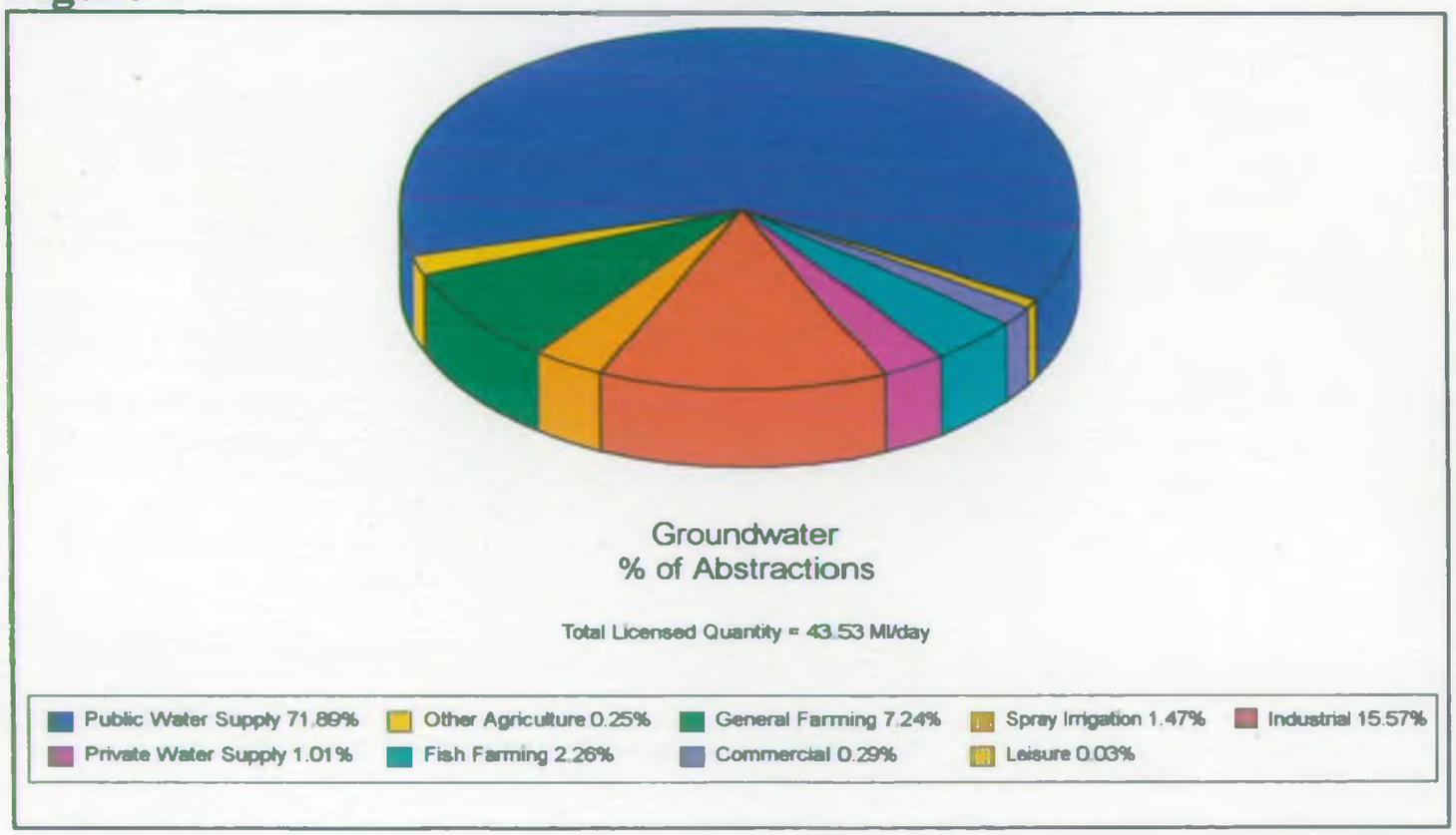


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Table 4 shows that although licensed abstractions from surface sources dominate in the Parrett Catchment there is a significant volume of licensed groundwater abstraction. This reflects the catchment's hydrogeology (see Section 3.3.1). Maps 20 and 21 show the distribution of the larger licensed abstractions (>0.3 Ml/d) from the Parrett Catchment.

By volume the largest licensed groundwater use is public water supply, although general farming accounts for the largest number of licences. The largest licensed surface water use is for public water supply although there are only five licences. This information is summarised as pie-charts in Figures 1, 2 3 and 4.

Licensed abstractions fall into the two categories of consumptive and non-consumptive use. Consumptive uses involve the loss of some of the water abstracted. All the public water supply and spray irrigation abstractions are consumptive. Non-consumptive uses return most of the abstracted water back into the catchment close to the point of abstraction e.g. fish farms. Consumptive uses have potentially more impact on rivers than non-consumptive, though the latter can have local impacts depending on the rates of abstractions and local conditions. The proportion of abstracted water consumed under each use is shown in Table 4, the figures come from the Regional Water Resources Development Strategy (RWRDS) - "Tomorrows Water".

Consumptive uses account for 73% of the groundwater and 69% of the surface water annual authorized abstraction volume. The majority of authorized consumptive use abstraction volume is accounted for by the public water supply sources. (See Table 4 - Percentage of total column).

Public Water Supply

The key components of demand for public water in the Parrett Catchment are domestic and industrial/commercial consumers. Demand is centred in the large towns of Bridgwater and Yeovil with notable demands also arising from the smaller towns of Crewkerne, Ilminster, Langport, Sherborne and Somerton.

<u>Supplying this water demand</u>

Wessex Water Services Ltd (WWSL) is the provider of mains public water within the catchment. The company strategically plans the supply of public water within distinct customer supply zones. Three supply zones make up the area covered by WWSL, including the Somerset Supply Zone. The whole of the Parrett Catchment lies within WWSL's Somerset Supply Zone. The company abstracts water from sources in the Parrett to meet customer demand within the catchment. The company also abstracts water from the catchment to meet needs elsewhere in the Supply Zone by shifting water around the zonal distribution system.

Currently, the demand for public water in the Somerset Supply Zone is 124 Ml/d, which exceeds the company's resources within the Zone by 9 Ml/d. WWSL meets this current demand by importing water to the Zone. Of the WWSL's resource of 115 Ml/d some 60 Ml/d comes from sources within the Parrett Catchment. The remainder is supplied from sources outside the Parrett Catchment via a piped supply grid.

Licensed Public Water Supply Abstractions

WWSL has 20 licences to abstract water within the Parrett Catchment (Table 5). These authorize a total maximum abstraction of 40 Ml/d at any given time. Fifteen are groundwater licences but the biggest proportion of the authorized abstraction comes from the five surface water licences (Map 21).

Table 5: Public Water Supply Abstractions

Source	Daily licensed quantity Ml	Annual licensed quantity Ml	Comments
Surface			
Durleigh	30.000	8000	Impounding reservoir highly dependent on pumped abstraction from the Taunton & Bridgwater Canal.
Sutton Bingham	22.000	5546	Impounding reservoir supported in a minor way by abstraction from the River Yeo at Clifton Maybank.
Ashford	15.900	5000	Impounding Reservoir.
Clifton Maybank	18.600	4546	River Yeo abstraction to fill Sutton Bingham Reservoir can be supported by releases from Sherborne Lake.
Taunton & Bridgwater canal	18.000	4300	Rate of abstraction from the canal to assist filling Durleigh reservoir is conditional on availability of flows at the combined gauging stations on the Halse Water and River Tone.
Total	104.500	27392	
Ground			
Lake	11.000	3000	Borehole.
Compton Durville	5.900	1730	Borehole.
Pole Rue	4.546	1659	Borehole.
Woolcombe	5.000	1150	Spring.
Castleton	3.910	909	Borehole.
Waterloo Farm	1.500	475	Borehole.
Bradley Head	1.500	420	Borehole.
Stockwood	1.655	409	Springs.
Doddington	1.137	363	Springs.

Source	Daily licensed quantity Ml	Annual licensed quantity Ml	Comments
Milborne Wick	0.982	359	Borehole.
Cudworth	0.832	304	Spring & well.
Castle Cary	0.900	250	Well.
Dommett	0.560	163	Springs.
Corscombe	0.500	150	Springs.
Maiden Beech	0.568	80	Borehole.
Total	40.490	11421	

The company's key surface water supplies are all from reservoirs. WWSL is authorized to abstract up to 30 Ml/d from Durleigh reservoir to meet demand in the Bridgwater area. Water abstracted from the Taunton and Bridgwater Canal by WWSL under a licence held by British Waterways adds to the storage at Durleigh Reservoir from catchment runoff. The canal is supplied by water from the River Tone. WWSL is authorized to abstract from an impounding reservoir at Sutton Bingham to a maximum of 22 Ml/d. This reservoir is used to meet demand in Yeovil. WWSL may on occasion pump water from the River Yeo at Clifton Maybank to fill Sutton Bingham. The abstraction at Clifton Maybank itself can be supported by water released from Sherborne Lake. WWSL's third main surface abstraction is from Ashford reservoir from which the company is licensed to take almost 16 Ml/d.

Of WWSL's key groundwater abstractions the largest groundwater licence is for the Lake Farm Source from which the authorized maximum abstraction is 11 Ml/d.

Other Abstractions

The total volume of abstractions authorized for purposes other than public water supply represents an average of 49.15 Ml/d (Annual authorized volume divided by 365 days) (see Table 4). Of this averaged total 12.23 Ml/d is from groundwater sources and 36.92 Ml/d is from surface water sources. There are 481 groundwater licences and 115 surface water licences for private purposes. These figures reflect the fact that the exploitation of water resources for private use in the Parrett Catchment is based mainly on surface abstractions. But the large number of groundwater licences reflects the presence of both major and minor aquifers in the catchment.

The largest private groundwater abstractions are for industrial, general farming, fish farming and spray irrigation purposes. Fish farming is the largest licensed private surface abstraction purpose. However, as mentioned above, fish farming is non-consumptive since all of the abstracted water is returned to the river near the point of abstraction.

By multiplying the authorized quantity by the proportion of the abstraction consumed for each category of licensed purpose it is possible to define the current net resource

commitment. Using the information in Table 4 the annual net resource commitment for the Parrett Catchment for purposes other than public water supply is 3210.52 Ml or an average of 8.8 Ml/d.

The net resource commitment excludes unlicensable uses of water, the most significant of which is for wet fencing. This use is an essential element of agricultural practice in the middle and lower reaches of the catchment and is a large consumptive use often involving the transfer of water over considerable distances. The operation of the wet fencing systems represents a form of irrigation other than spray irrigation and therefore constitutes a land drainage activity which is not covered by the provisions of the Water Resources Act 1991. The regulation of this type of abstraction is exercised locally by Internal Drainage Boards (IDBs). Subsequent abstraction from these drainage ditches or "rhynes" for spray irrigation however is licensed and controlled by the Environment Agency.

Significance of Abstractions

The pie charts (Figures 1-4) show the relative importance of the various categories of abstraction. After public water supply the next most significant licensed uses, based on licensed quantity, are fish farming and industry. Fish farming and industrial abstractions and characterised by a few sites which abstract large quantities of water whereas other uses such as spray irrigation and general farming are characterized by many sites abstracting relatively smaller amounts.

Key Sites

The abstraction licence maps highlight several large individual abstractions: an abstraction by the RSPB and a fish farm in the south west of the catchment, and abstractions by Royal Ordnance Plc and UCB Cellophane Limited in the north west of the catchment.

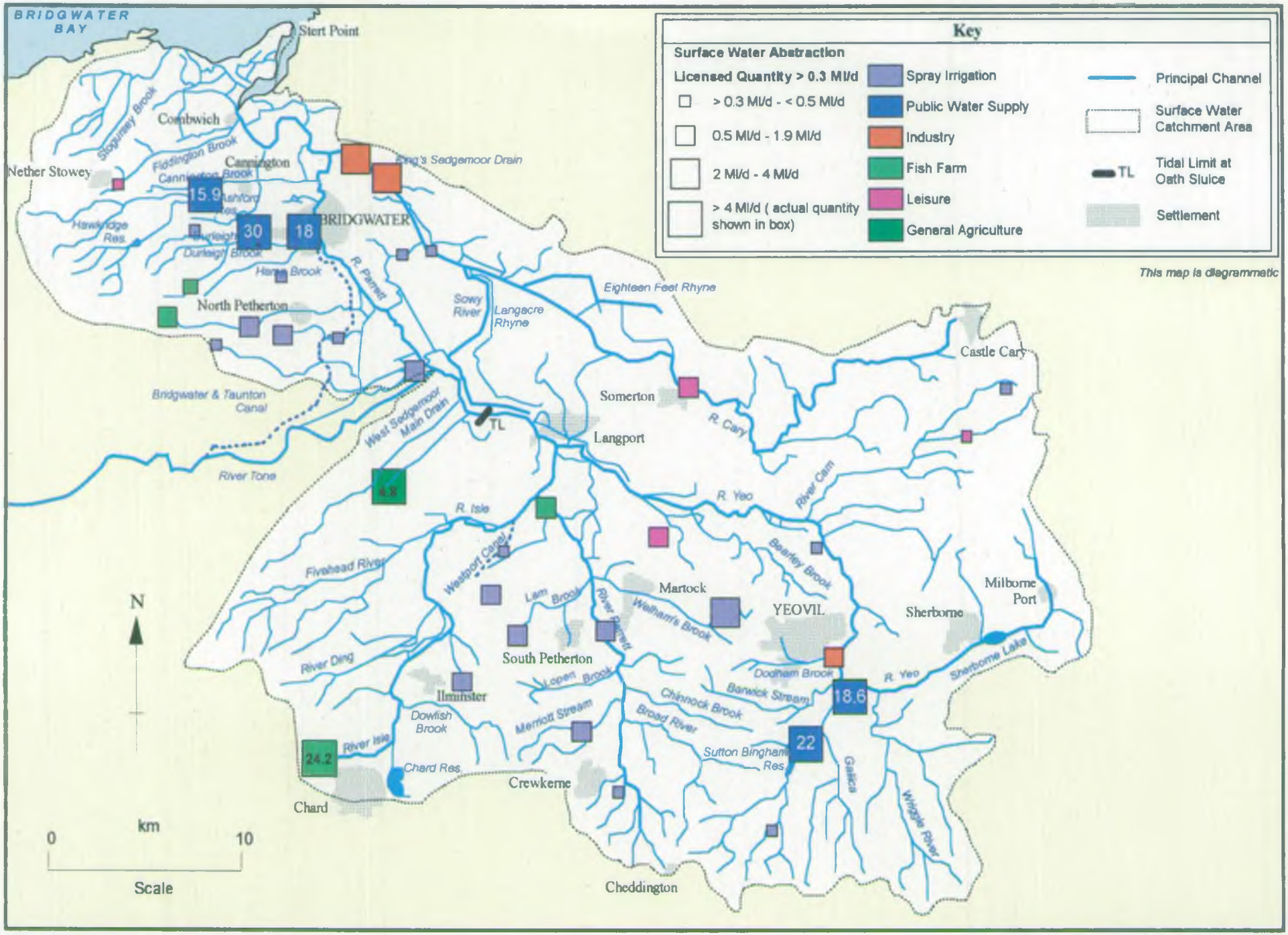
The RSPB hold an agricultural abstraction licence to take water from the Middle Drain system for the purpose of maintaining water levels in the West Sedgemoor Nature Reserve. This abstraction allows traditional agricultural practices to take place, thereby maintaining a suitable habitat for birds.

The Royal Ordnance Plc at their Puriton site abstract from the King's Sedgemoor Drain for industrial purposes. They also have an emergency abstraction from the Huntspill River which can be operational if abstraction from the King's Sedgemoor Drain is prevented. The UCB Cellophane Limited abstraction is also from the King's Sedgemoor Drain again for industrial use. Both of these licences contain conditions to protect water levels in the King's Sedgemoor Drain.

The licensed abstraction to the fish farm is at Combe St Nicholas. The licence authorizes a total abstraction of 24.2 Ml/d from the River Isle, representing 86% of the total abstraction by fish farms within the Parrett Catchment.

This section has described the licensed abstraction of water for public water supply and private use in the Parrett Catchment. Section 7.2 considers the current impact these abstractions are having on the environment and how future public and private water needs

Map 21 - Surface Water Abstractions



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are to be met. The Environment Agency Regional Water Resources Strategy shows how future increased need for water can be met without compromising the environment.

Drought - the Levels and Moors

During drought conditions licensed abstractions may be restricted or curtailed as explained in Section 6.11 Water Abstraction and Supply. However, the supply of summer water to the drainage board areas, so essential to agriculture and wildlife, is unlicensed and is organized and controlled by our Flood Defence function. Very low flows in the rivers require the introduction of special conservation measures and the rationing of supplies to the moors to ensure the most equitable distribution of available resources. In the extreme circumstance of complete failure of summer water supply in a particular area, special arrangements have been made for farmers to obtain water for cattle directly from other rivers in the locality.

6.12 EFFLUENT DISPOSAL

Here we consider the disposal of non-radioactive effluent directly to rivers, estuaries, the sea or into the ground. Discharges include treated sewage and industrial wastes. We regulate the disposal of effluent by issuing consents or IPC authorizations where appropriate to control discharges and taking action if a river is accidentally polluted. Rivers can render the main constituents of many effluents harmless by natural processes, providing that effluent quality is properly controlled, by taking enforcement action if limits are exceeded.

Discharges to water, air or land from the larger industrial processes, (Part A Processes) are regulated under our Integrated Pollution Control system (see Section 6.14 Controlled Industrial Processes).

Our Objective

To protect the water environment from harm caused by the disposal of effluent and allow the widest possible use to be made of rivers.

The Role of the Environment Agency

We have duties and powers to:

- authorize discharges through a system of consents or IPC authorizations where appropriate. It is illegal to discharge sewage effluent or trade waste without the consent of the Environment Agency. We consider applications for consent to discharge on a case by case basis and can refuse to consent a discharge if it will cause an unacceptable deterioration in water quality.
- check discharges to see if they comply with consent standards. We may prosecute dischargers if they exceed consent conditions.
- prevent illegal discharges.
- influence investment in sewerage and sewage treatment by the water companies in line with AMP2 guidelines (see section below on Improvements to Wessex Water Services Ltd (WWSL) Discharges).

We are involved in a range of activities:

- We work with planning authorities to control development where the sewerage or sewage treatment system is overloaded.
- We liaise with trade dischargers, farmers and WWSL, carry out regular site inspections and monitor discharge quality.
- We constantly review and develop our approach to water sampling.

Improvements to Wessex Water Services Ltd (WWSL) Discharges

Improvements to WWSL's discharges over the next 10 to 15 years are subject to available funding approved by OFWAT, the water industry's economic regulator. A Strategic Business Plan, (Asset Management Plan 2 (AMP2)), for these schemes was developed based on guidelines agreed between the NRA, Department of the Environment (DoE), Water Services Companies and OFWAT. The plan was submitted to OFWAT early in 1994.

In order of priority, schemes included are:

1 Schemes required to meet and maintain **current** EC and domestic statutory obligations.
2 Schemes required to meet and maintain **new** EC and domestic statutory obligations.
3 Schemes which already have been separately justified, required to maintain river quality relative to the 1990 NRA survey of water quality or to achieve river or marine improvements.

OFWAT declared the associated customer charging base in July 1994. The NRA agreed improvement plans for the schemes shown in Table 6 below. The programme will be monitored by the Environment Agency.

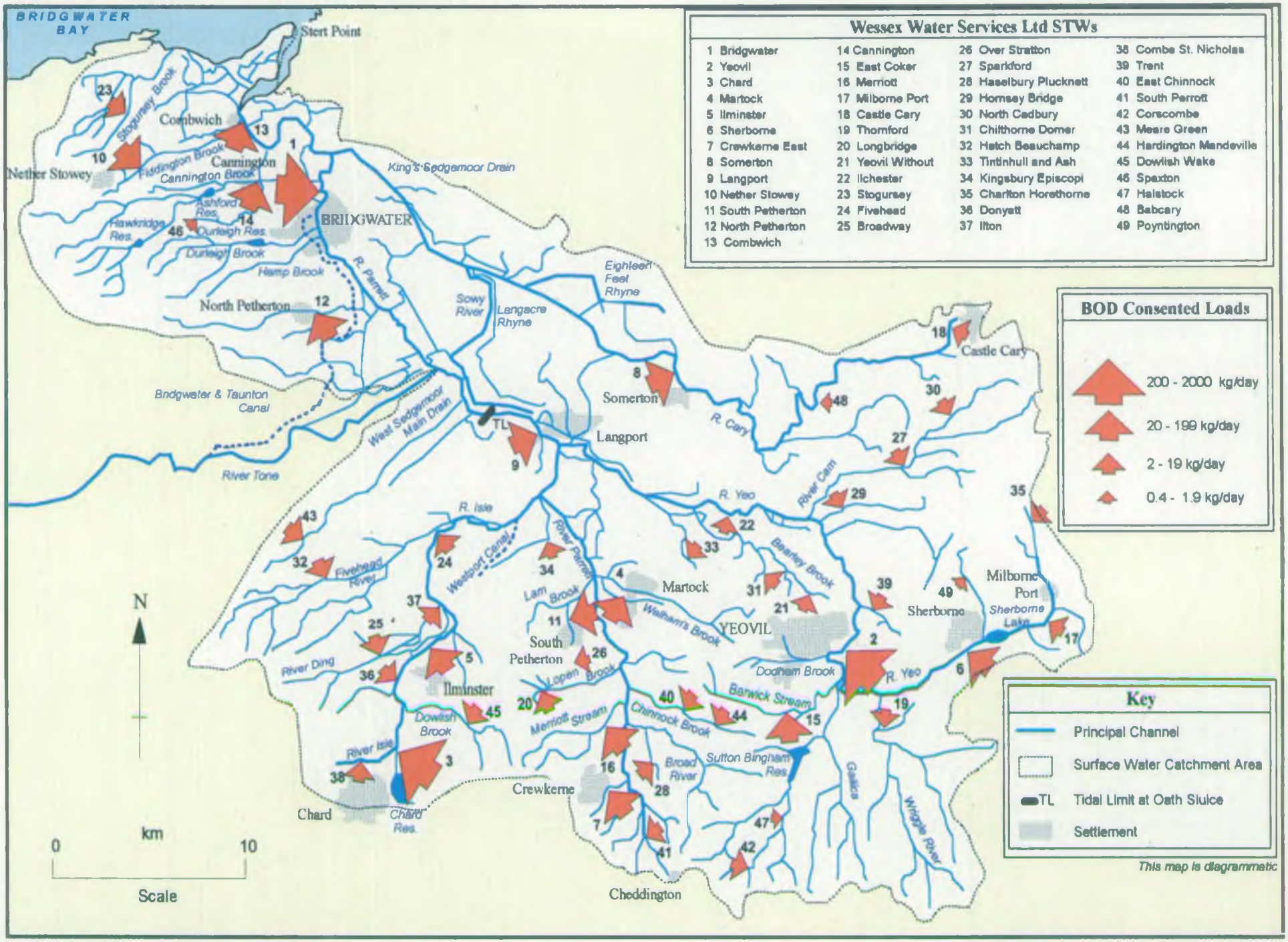
Under the AMP2 programme WWSL plan to install secondary treatment at Bridgwater STW under the provisions of the Urban Waste Water Treatment Directive.

In addition WWSL will continue to operate chemical disinfection at Bridgwater STW until an improved method of disinfection is installed. We are discussing the options for disinfection at this site. This will protect the water quality of EC Bathing Waters Directive designated sites in the Severn Estuary such as Burnham-on-Sea.

Table 6: Wessex Water Services Ltd's AMP2 Programme

LOCATION	RECEIVING WATER	PROVISIONAL COMMISSIONING DATE	NOTES
South Perrott	River Parrett	1998	Works in progress.
Milborne Port	River Yeo	1998	
North Cadbury	River Cam	1998	
South Barrow	River Cam	-	
North Petherton	Petherton Brook	-	Investment needed to maintain river quality at 1990 survey levels.
Bridgwater	Parrett Estuary	2000	Improved secondary treatment needed under EC UWWTD. Disinfection needed to help ensure bathing waters in the Severn Estuary comply with the Bathing Waters Directive standards.

Map 22 - Wessex Water Services Ltd STWs



Wessex Water Services Ltd STWs

1 Bridgwater	14 Cannington	26 Over Stratton	38 Combe St. Nicholas
2 Yeovil	15 East Coker	27 Sparkford	39 Trent
3 Chard	16 Merriott	28 Haselbury Plucknett	40 East Chinnock
4 Martock	17 Milborne Port	29 Hornsey Bridge	41 South Perrott
5 Ilminster	18 Castle Cary	30 North Cadbury	42 Corscombe
6 Sherborne	19 Thornford	31 Chilthorne Domer	43 Meare Green
7 Crewkerne East	20 Longbridge	32 Hatch Beauchamp	44 Hardington Mandeville
8 Somerton	21 Yeovil Without	33 Tintinhull and Ash	45 Dowlish Wake
9 Langport	22 Ilchester	34 Kingsbury Episcopi	46 Spaxton
10 Nether Stowey	23 Stogursey	35 Charlton Horethorne	47 Halstock
11 South Petherton	24 Fivehead	36 Donyatt	48 Babcary
12 North Petherton	25 Broadway	37 Ilton	49 Poyntington
13 Combwich			

BOD Consented Loads

- 200 - 2000 kg/day
- 20 - 199 kg/day
- 2 - 19 kg/day
- 0.4 - 1.9 kg/day

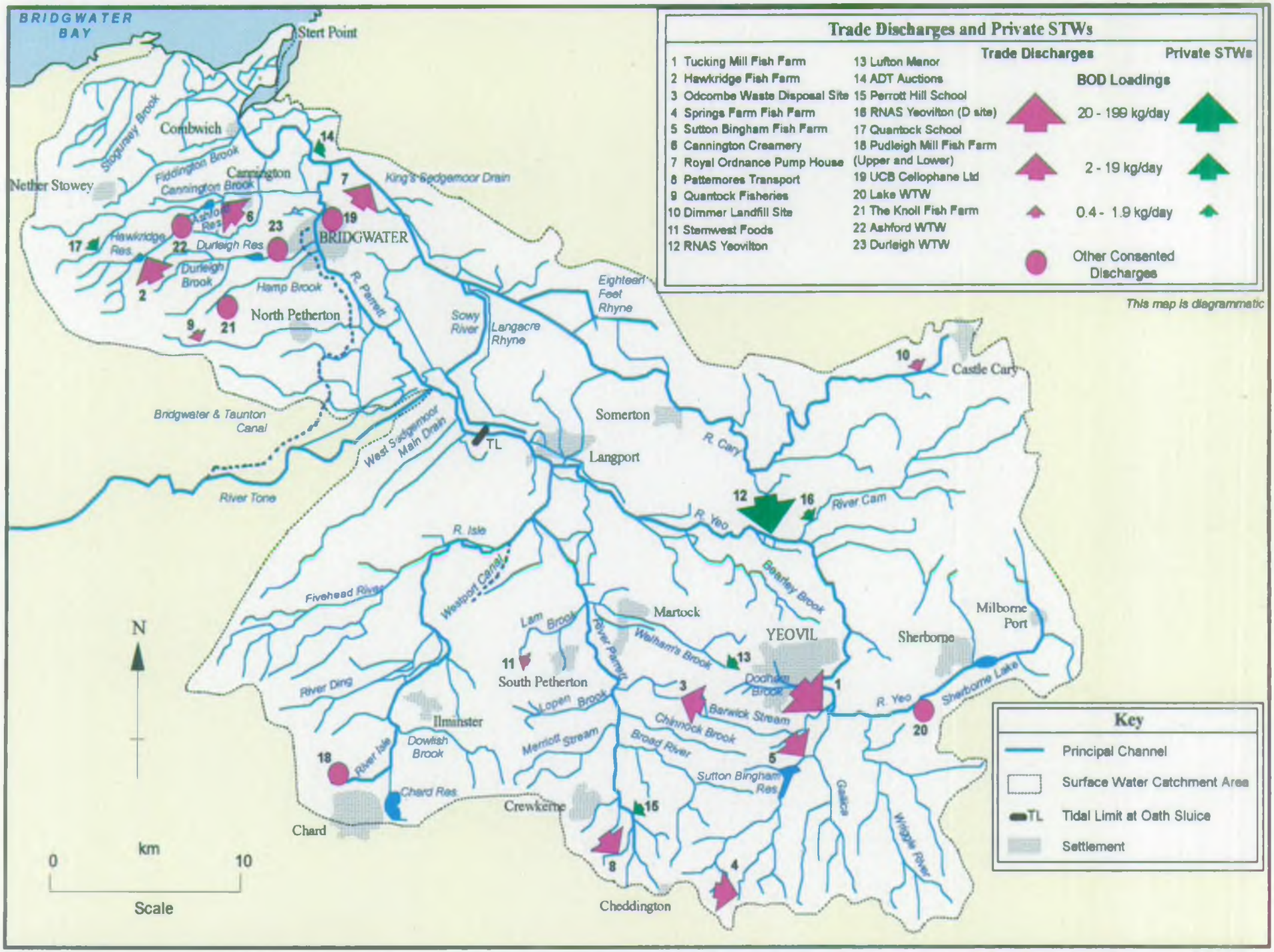
Key

- Principal Channel
- Surface Water Catchment Area
- TL Tidal Limit at Oath Sluice
- Settlement

This map is diagrammatic

Information correct as of December 1996

Map 23 - Other Discharges



Trade Discharges and Private STWs

1 Tucking Mill Fish Farm	13 Lufton Manor
2 Hawkridge Fish Farm	14 ADT Auctions
3 Odcombe Waste Disposal Site	15 Perrott Hill School
4 Springs Farm Fish Farm	16 RNAS Yeovilton (D site)
5 Sutton Bingham Fish Farm	17 Quantock School
6 Cannington Creamery	18 Pudleigh Mill Fish Farm
7 Royal Ordnance Pump House	(Upper and Lower)
8 Pattemores Transport	19 UCB Cellophane Ltd
9 Quantock Fisheries	20 Lake WTW
10 Dimmer Landfill Site	21 The Knoll Fish Farm
11 Sternwest Foods	22 Ashford WTW
12 RNAS Yeovilton	23 Durleigh WTW

Trade Discharges — Private STWs

BOD Loadings

20 - 199 kg/day

2 - 19 kg/day

0.4 - 1.9 kg/day

Other Consented Discharges

This map is diagrammatic

Key

- Principal Channel
- Surface Water Catchment Area
- TL Tidal Limit at Oath Sluice
- Settlement

Information correct as of December 1996

LOCATION	RECEIVING WATER	PROVISIONAL COMMISSIONING DATE	NOTES
Chard	River Isle	1999	New STW needed to improve river water quality under National Environmental Programme.
Martock	Welham's Brook	1998	Improved treatment and relocation of outfall to River Parrett.

Local Perspective

Discharge consents only apply to point source discharges from a known location. Diffuse sources of pollution, such as agricultural runoff see Section 6.9 Farming, and pollution incidents, such as accidental spillages, are not authorized by discharge consents.

There are three types of consented discharge in the catchment:

- **Continuous**: from sewage and trade wastes.
- **Intermittent**: from storm overflows and emergency overflows (rainfall dependent).
- **Discharges to Ground**: into soakaways in the ground.

Continuous Discharges

These are continuous discharges of sewage and trade effluent. In areas covered by a mains sewerage system both trade effluents and sewage are normally treated at the local WWSL sewage treatment works (STW).

Details of STW discharges are shown on the WWSL STWs Map - Map 22. Other continuous discharges are shown on the Other Discharges Map - Map 23.

Rural catchments such as this often have a high proportion of unsewered property. We have a national policy to discourage the proliferation of small private treatment plants in favour of mains connections where this is reasonably practicable.

(i) Sewage

In this catchment there are 49 WWSL STWs and 6 private STWs with a consented daily load in excess of 0.4 kg. Load describes the amount of Biochemical Oxygen Demand (BOD) exerted by a discharge. The greater the load, the greater the impact on the receiving watercourse.

The STW with the greatest load is Bridgwater, which discharges to the Parrett Estuary at Chilton Trinity. Disinfection is carried out to help ensure bathing waters in the Severn Estuary comply with the Bathing Waters Directive Standards during the bathing season. In order to comply with the EC Urban Waste Water Treatment

Directive secondary (biological) treatment will be installed at Bridgwater STW by 2000.

It is Environment Agency policy to control, by means of consents all significant discharges of List I and List II substances. These are identified in the EC Dangerous Substances Directive. The only STW which is consented to discharge dangerous substances is Yeovil. The cadmium discharged from Yeovil STW is derived from trade discharges to sewer in the Yeovil area. These discharges to sewer are regulated by the Agency under the Environmental Protection Act 1990 or the Water Industry Act 1991.

The largest non-WWSL STW is at RNAS Yeovilton. As part of an ongoing project this STW is due to be refurbished and has been recently consented. Under the Environment Act, all MOD sites lost their Crown exemption from 1 April 1997. All MOD sites were invited to apply for discharge consents by 1 April 1996. In addition, there are approximately 25 surface water outfalls from Yeovilton which will be consented as part of the same project.

(ii) ***Trade***

In this catchment there are 11 trade sites which are consented to discharge a daily load in excess of 0.4 kg. Fish farms will be discussed in more detail in section 6.13. Two trade sites are consented to discharge List I and List II substances to watercourses. Dimmer Landfill Site is consented to discharge a range of List I substances, including mercury, cadmium, HCH-Gamma, aldrin, dieldrin and endrin and a range of List II substances, including iron, nickel, copper, arsenic, zinc, lead and chromium. A planned extension to the site is likely to result in a consent review. Odcombe Waste Disposal Site is consented to discharge iron. Stemwest Foods is consented to discharge tecnazene, a fungicide and sprout suppressant, from their potato preparation plant. This consent is likely to be reviewed in the near future.

The discharge of effluents from UCB Cellophane Ltd, Bridgwater, is made to public sewer and is subject to an Environment Agency IPC authorization, under Integrated Pollution Control. The authorization currently allows UCB to discharge untreated effluent to the River Parrett via the public sewer. This discharge is acidic and contains high levels of sulphide both of which are subject to a schedule of improvements detailed in the authorization. UCB are currently discussing their proposals with the Agency and they have submitted a consultant's report. The discharge from the end of this public sewer to the Parrett Estuary is then covered by an Environment Agency Deemed Discharge Consent. This consent is currently being reviewed to restrict the release of a range of Dangerous Substances. The Agency will also be undertaking its own impact assessment of both UCB and Bridgwater STW on the River Parrett.

Intermittent Discharges

These include surface water discharges, sewer storm overflows and pumping station emergency overflows, which are mainly associated with urban areas.

In a combined sewerage system a single pipe takes both sewage and surface water to the STW. In storm conditions the pipe will have insufficient capacity to carry the increased volumes and so a storm overflow is needed. In some cases properties may be at a lower level than the STW and so a pumped pipe called a rising main is used. If the pump fails due to an electrical or mechanical fault an emergency overflow is needed to protect properties against flooding with sewage.

In storm conditions large volumes of oily water can be generated by runoff from car parks and industrial estates. We carry out pollution prevention visits and surveys to identify problems. Bancombe Road trading estate in Somerton and Pen Mill trading estate in Yeovil have been surveyed recently. Action to reduce the risk of discharge is being taken.

Discharges to Ground

Outlying properties and small villages are generally not served by a STW. In such locations septic tanks to soakaway, individual package sewage treatment plants and sealed cesspools are commonly used alternatives. An Environment Agency Discharge Consent is not required for the use of a cesspool.

Pollution problems in local streams can arise where soakaway drainage is poor, such as in areas of heavy clay soil. In areas of porous rock (such as limestone) the rapid drainage of effluent through the soil can cause groundwater contamination. For example the marly soil around Bawdrip, near Bridgwater, means that soakaway drainage is poor whilst the sandy soils around Merriott are free draining, so there is a high risk of groundwater contamination from domestic soakaways.

6.13 FISH FARMS

Here we consider the use of riverside beds or ponds to rear fish and crayfish on a commercial basis. Water is not used up by fish farms but returned to the river close to the point of abstraction. There are two main types of fish farm; those using spring water which are located on the headwaters and small tributaries and those which divert river water through ponds. We authorize the taking of water from the river by issuing an abstraction licence and the return of the water to the river by giving a consent to discharge.

Our Objective

To protect rivers from the effects of fish farms.

The Role of the Environment Agency

We have duties and powers to:

- issue abstraction licences to protect the water environment and legal uses. We can put conditions on new licences to achieve this.
- issue discharge consents to protect the river from pollution caused by fish food or chemicals used to control pests or diseases.
- control the movement of some fish to prevent the spread of diseases. The Ministry of Agriculture, Fisheries and Food (MAFF) are responsible for registered fish farms.

Our work involves a range of activities:

- We tackle the problems caused by historic licences.
- We prevent fish escaping to the wild by making sure that farms fit screens.
- The lifecycle of wild fish in a river can be badly disrupted by the discharge from fish farms. We try to prevent this happening when we approve new licences.
- We consult fully with local planning authorities on applications for new fish farms.
- We are looking at ways of regulating fish farming in cages in estuaries.

Local Perspective

Freshwater Aquaculture

In this catchment there are seven authorized fish farms, as shown on Map 23 - Other Discharges. The fish farms at Sutton Bingham and Hawkridge are operated by Wessex Water Services Ltd (WWSL) and are used for restocking of reservoirs. At Pudleigh Mill there are two sites and we are presently determining a consent to discharge application for the lower fish farm. The largest consented fish farm at Tucking Mill has not been operational for some time so the consent needs to be reviewed. At Quantock Fisheries the abstraction licence authorizes a greater volume than the discharge consent. This problem will be addressed in the near future by a consent review. A review is also required at the Knoll Fish Farm, as the existing consent has no volume limit.

6.14 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.

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. A key concept of IPC is the precautionary principle - to seek to prevent a release at source; BATNEEC and BPEO are important tools in the practical application of this principle.

Two lists of processes have been prescribed by regulations for control: Part A processes are controlled under IPC by the Agency; releases to the air from Part B processes are controlled at a local level under a system of Local Authority Air Pollution Control. In this section we list Part A Process Operators by process type and summarize the most significant releases to air permitted by their authorizations. Direct discharges to water are summarized in Section 6.12 Effluent Disposal.

IPC authorizations are issued under Section 6 of the Environmental Protection Act 1990 to operate a particular process which is described in Regulations. The authorization comprises the following parts, as appropriate to the process concerned:

Part 1 operation of process, records and notifications
Part 2 releases into air
Part 3 releases into controlled waters
Part 4 releases into sewer
Part 5 releases into on-site effluent treatment plant
Part 6 other releases
Part 7 reporting requirements
Part 8 improvement programme
Part 9 interpretation
Schedules 1-3 notification and reporting forms

IPC authorizations are normally available for public examination at the appropriate Agency and local authority public registers. As well as requiring Operators to manage, control and report releases from their processes in full compliance with their authorizations, the Agency's IPC Inspectors regularly inspect processes by site visits and spot checks to ensure compliance is actively maintained and improvement actions are progressed. The Agency has strong enforcement powers under the Environmental Protection Act 1990 to take action where breaches of compliance have occurred, including prohibition and/or prosecution action in serious cases.

Local Perspective

The currently authorized IPC processes in the catchment are shown in Table 7.

Table 7: Authorized IPC Processes in the Parrett Catchment

Operator	Description of process(es)	Main authorized releases to air
UCB Cellophane Ltd, Bridgwater	Combustion process Chemical process - the production and casting of viscose	Sulphur dioxide Nitrogen oxides Particulate matter Carbon disulphide Hydrogen sulphide
Ionics (UK) Ltd, Bridgwater	Chemical process - the electrolysis of brine	Chlorine
Crosby Ltd, Bridgwater	Timber process - the manufacture and chemical treatment of doors	Particulate matter Volatile organic compounds
Sherry and Haycock Ltd, Bridgwater	Timber process - the manufacture and chemical treatment of roof joist components	Volatile organic compounds
GKN Westland Aerospace (Transmissions) Ltd, Yeovil	Chemical process - cadmium plating of components	Trichloroethylene

6.15 RADIOACTIVE SUBSTANCES

The Environment Agency is the enforcement authority for England and Wales of the Radioactive Substances Act 1993. This statute is concerned with the keeping, use and disposal of radioactive substances and, in particular, the regulation of radioactive waste disposal.

Radioactive substances are present in the environment as a result both of natural processes and of man's technological developments. The uncontrolled and incautious use of these substances can pose both immediate and long term hazards.

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

The major nuclear establishments are licensed to operate by the Nuclear Installations Inspectorate (NII) part of the Health and Safety Executive, but discharges from them are authorized by the Agency. Radioactive disposals cannot take place without an authorization issued by the Agency under RSA 93. The authorizations include discharge limits and conditions covering record keeping, monitoring, maintenance, etc. Discharge limits are set to ensure that any radiation doses received by the public as a result are well below accepted dose limits for public safety.

6.15.1 Local Perspective

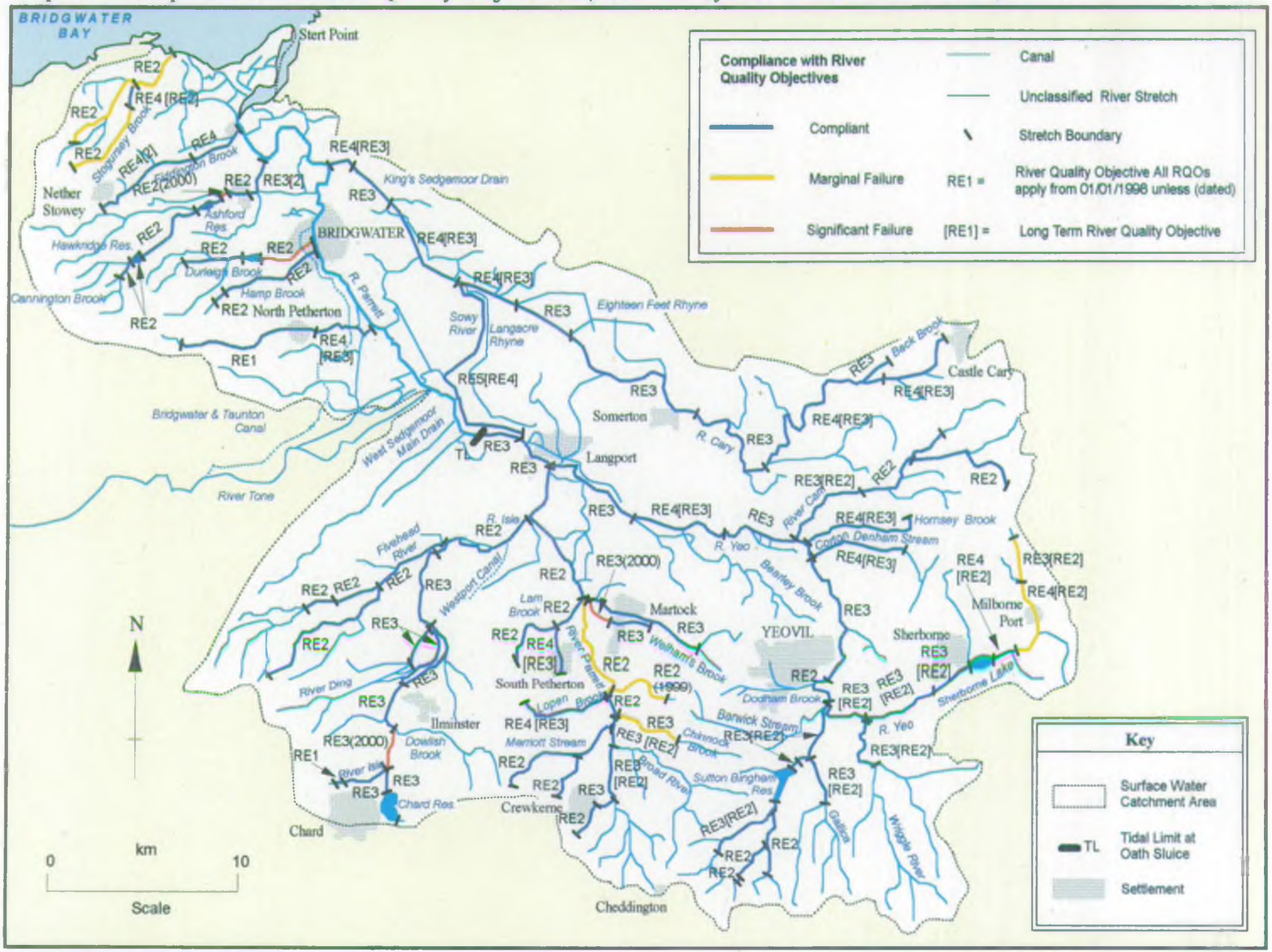
There are some 8 sites in the catchment area which are currently registered under the Radioactive Substances Act, one of which is a hospital which is also authorized to accumulate and dispose of radioactive waste. These sites are mainly manufacturing processes using sealed radioactive sources for industrial process control purposes.

The current registered and authorized users of radioactive substances in the catchment are shown in Table 8.

Table 8: Sites Registered under the Radioactive Substances Act

	Use/Notes
East Somerset NHS Trust, Yeovil District Hospital.	Authorized and registered for radioactive substance use in medical diagnosis and treatment.
Brithene Films Ltd, Bridgwater.	Registered for sealed sources used in industrial process control.
UCB Cellophane Ltd, Bridgwater.	Registered for sealed sources used in industrial process control.
Bonded Fibre Fabric Ltd, Bridgwater.	Registered for sealed sources used in industrial process control.
Borden Chemicals UK Ltd, Bridgwater.	Registered for sealed sources used in industrial process control.
Westland Engineering Ltd, Yeovil.	Registered for sealed sources used in luminous devices.
GKN Westland Helicopters Ltd, Yeovil.	Registered for sealed sources used in industrial process control and luminous devices.
Sutton Farm Partnership, Sutton Montis.	Applied for registration for mobile use of sealed source in crop flow detector.
Nuclear Electric Ltd, Combwich Laboratory.	Authorized and registered for radioactive substances analytical laboratory for environmental monitoring purposes.

Map 24 - Compliance with River Quality Objectives (River Ecosystem Classification 1994)



Information correct as of December 1996

7.1 WATER QUALITY

We aim to maintain and where appropriate improve the quality of water for all those who use it. We achieve this by setting water quality targets for the catchment based on:

- River Quality Objectives to protect recognised uses.
- Standards laid down in EC Directives.
- International commitments to reduce the amount of Annex 1A substances entering tidal waters. (See Section 7.1.8).

There is no formal scheme of objectives for tidal waters. However, objectives are provided by:

- the EC Bathing Water Directive which is driving investment at West Huntspill and Bridgwater STWs.
- the EC Urban Waste Water Treatment Directive which will ensure secondary treatment of sewage at West Huntspill and Bridgwater STWs.
- the EC Dangerous Substances Directive.

Nationally we are working with the Government towards the establishment of Statutory Water Quality Objectives for all catchments. At present there is only one pilot catchment, the Upper Bristol Avon, which has Statutory Water Quality Objectives.

In this chapter, we report on the state of the catchment by comparing existing water quality with relevant water quality targets. We have identified issues where targets are not being achieved and action is needed to improve water quality. We have also identified other water quality issues in the catchment.

7.1.1 River Quality Objectives

Targets

The water quality targets that we use in all rivers are known as River Quality Objectives (RQOs). RQOs are used for managing water quality and are based on the River Ecosystem (RE) classification scheme. The River Ecosystem scheme is made up of five water quality classes (RE1 to RE5). These classes reflect the chemical quality needed by different types of river ecosystem including the types of fishery they can support. RQOs are normally to be achieved immediately unless a later date is indicated in brackets following the RE Class e.g. RE3 (1998).

We set RQOs based on the need to protect current water quality and future use. All RQOs must be achievable and sustainable. This means we that we must be able to identify what needs to be done to meet the RQO. We must also be able to ensure, as far as is practicable to do so, that water quality can be maintained at this level in the future. The available investment to improve water quality, including, for example Wessex Water Services Ltd's (WWSL) AMP2 investment programme agreed with Government (OFWAT) needs to be acknowledged (see Section 6.12 Effluent Disposal).

The RQOs based on the RE classification that we are proposing for the Parrett Catchment are shown on Map 24.

Where an RQO is not achievable or sustainable over the next 5-10 years, for example because there are no resources for investment, we set a long term RQO. This is indicated in brackets beside the short term RQO on Map 24. We will use these long term RQOs as a basis for setting consents for new discharges and planning for future water quality improvements. It should be noted that Map 24 only shows compliance with current RQOs - it does not show compliance with long term RQOs.

State of the Environment - Compliance with RQOs and Long Term RQOs

Map 24 also shows 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 1992 and 1994. 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 127 monitored river stretches (361 km) in the Parrett Catchment there are 4 stretches (8.5 km) which significantly fail to meet their RQO, and 8 stretches (33 km of river) which marginally fail to meet their RQO. The reasons for these failures are explained below looking at each watercourse in turn.

We have also assessed whether river stretches meet their long term RQO, and the reasons for failures to meet the long term RQOs are explained below.

<u>Stogursey Brook</u>

Two stretches, Stringston - Confluence with Dodington tributary and Stringston - Confluence with Dodington tributary - Sea, marginally failed to comply with their RQOs of RE2 due to elevated biochemical oxygen demand. A third stretch Dodington - Stogursey marginally failed to comply with its RQO of RE2 due to elevated biochemical oxygen demand and total ammonia. Previous poor water quality in the two stretches, Stringston - Confluence with Dodington tributary and Stringston/Dodington tributaries confluence - Sea, resulted in a field investigation in 1993, which found polluting discharges from several septic tanks. These have largely been resolved, but further work may be required. Improvements in farming activities have also been made. Recent data (1995) shows that water quality has improved.

The stretch, Stogursey - Confluence with Stringston tributary, marginally failed to comply with its long term RQO of RE2 due to biochemical oxygen demand. Investment at Stogursey STW may be required in AMP3 to allow the long term RQO to be met.

<u>Parrett</u>

The stretch, Confluence with Crewkerne Stream - Confluence with Broad River, marginally failed to comply with its long term RQO of RE2 due to biochemical oxygen demand. This stretch receives effluent from many small discharges and farms. The stretch Confluence

with Broad River - Confluence with Chinnock Brook marginally failed its long term RQO RE2 due to elevated biochemical oxygen demand. The causes of downgrading in water quality are unclear.

Previous Upper Parrett surveys have failed to identify any specific source and have ruled out the impact of minor tributaries such as the Broad River and Chinnock Brook. We hope that a comprehensive survey in 1997 on both these Parrett stretches will determine whether other tributaries, in particular the Merriott Brook and Crewkerne Stream, have any impact.

Fiddington Brook

Water quality in the Fiddington Brook from Source to Hornhill met its long term RQO in 1994. This stretch receives effluent from Nether Stowey STW. The quality of the Nether Stowey STW discharge has recently improved following the closure of a pig farm which sent effluent to this STW. However, water quality could deteriorate if this situation changed. Investment may be required at this STW in AMP3 to ensure the long term RQO is sustainable.

Cannington Brook

The stretch from Blackmore Farm to Bradley Green significantly failed to comply with its RQO of RE2 due to elevated biochemical oxygen demand; however, the target date for compliance is the year 2000. Our Area Water Quality staff have requested a farm improvement programme which is expected to be completed by June 1997. The stretch from Bradley Green to Cannington has been impacted by a discharge from a potato processing unit. However, the operation on this site has changed significantly and the impact has reduced markedly. Further improvements may be required to eliminate contaminated site drainage discharges.

The stretch, Cannington - Confluence with Tidal Parrett, significantly fails to comply with its long term RQO of RE 2 due to elevated biochemical oxygen demand. Cannington STW is operating within the terms of its consent. However, some improvements may be required at this STW in AMP3 to achieve the long term RQO.

King's Sedgemoor Drain

The stretch, Confluence with 18 Feet Rhyne - Confluence with Sowy, marginally failed to comply with its long term RQO RE 3 due to low dissolved oxygen and elevated biochemical oxygen demand and unionised ammonia. The two stretches, Confluence with Sowy - Bawdrip and Dunball 1 - Confluence with Tidal Parrett, marginally failed to comply with their long term RQOs of RE3 due to low dissolved oxygen and elevated biochemical oxygen demand. Algal blooms occur on the King's Sedgemoor Drain which cause high biochemical oxygen demand results in spring and summer and variable dissolved oxygen concentrations. These algal blooms develop because the water is enriched with nutrients and penned.

The elevated levels of un-ionized ammonia are likely to be caused by farming activities. Catchment investigations have identified a significant polluting input from a pig farm. The company running the farm has now been prosecuted and fined. Improvements made at the farm should prevent pollution recurring and significantly improve downstream water quality.

A farm pollution prevention survey of all farms in the catchment with consented discharges has commenced and should further improve catchment water quality by controlling discharges.

Cary

The stretch, Lovington - Higher Farm, significantly failed to comply with its long term RQO of RE3 due to high levels of unionised ammonia, and marginally failed to comply with its long term RQO due to low concentrations of dissolved oxygen, and elevated levels of biochemical oxygen demand and total ammonia. The reasons for downgrading of water quality are unclear, although the most likely cause is diffuse agricultural runoff, and we will investigate further.

Sowy

The stretch, King's Sedgemoor Drain - Parrett, marginally failed to comply with its long term RQO RE4 due to elevated biochemical oxygen demand and pH. High biochemical oxygen demand levels generally occurred in spring/early summer and were associated with high dissolved oxygen and pH levels which suggests algal blooms are the cause. The Sowy is penned and flows are low in summer.

Durleigh Brook

The stretch, u/s Durleigh Reservoir - Confluence with Parrett, marginally failed to comply with its RQO of RE3 (1998) due to low dissolved oxygen and elevated biochemical oxygen demand. River water quality in this stretch has been impacted in the past by the discharge from Durleigh WTW, which is no longer discharging. At present the monitoring site is located where the Brook is virtually stagnant in summer and as this is unrepresentative of water quality in the Brook we will relocate the monitoring site to a more representative site.

Petherton Stream

Water quality in the Petherton Stream from North Petherton to Confluence with Parrett met its long term RQO in 1994. However, water quality in this stretch is variable, and has sometimes failed to meet the long term RQO. The cause of failure to consistently meet the long term RQO is North Petherton STW. Although WWSL have some investment planned for this STW to ensure the current RQO is met in future, some extra investment may be required in AMP3 to ensure the long term RQO is sustainable.

Yeo

The stretch, Milborne Wick - Milborne Port, marginally failed to comply with its RQO of RE4 due to elevated biochemical oxygen demand, and significantly failed to comply with its long term RQO of RE2 due to elevated biochemical oxygen demand, total ammonia and unionised ammonia. River water quality in these stretches is variable. Diffuse agricultural runoff, urban and agricultural point source discharges, and a tannery in Milborne Port may be contributing to poor water quality. This part of the river dried up in 1995, reducing the level of dilution for these effluents. We will evaluate studies carried out in 1996.

The stretch, Milborne Port - u/s Sherborne Lake, marginally failed to comply with its long term RQO of RE2 due to low dissolved oxygen and elevated total ammonia and unionised ammonia. A high proportion of flow in this section of the River Yeo is from groundwater which is naturally low in dissolved oxygen. Agricultural inputs from Purse Caundle may also be having an adverse effect on water quality.

The stretch, Upstream Sherborne Lake - Sherborne STW, significantly failed to comply with its long term RQO RE2 due to low dissolved oxygen, and marginally failed to comply due to elevated biochemical oxygen demand. The stretch, Sherborne STW - Confluence with Wriggle, significantly failed to comply with its long term RQO RE2 due to elevated biochemical oxygen demand. The stretch, Confluence with Wriggle - Confluence with Sutton Bingham Streams, marginally failed to comply with its long term RQO of RE2 due to elevated biochemical oxygen demand. Investigations into the causes of the downgrading in water quality will be carried out. Poor water quality downstream of Sherborne Lake may partly be due to abstraction (see Issue 18 - Impact on water quality of River Yeo abstraction).

Cam

The stretch, Queen Camel - Confluence with Yeo, marginally failed to comply with its long term RQO of RE2 due to biochemical oxygen demand. A water quality investigation into possible farm waste inputs will be undertaken.

Corton Denham Stream

The stretch, Rimpton - Confluence with Yeo, marginally failed to comply with its long term RQO of RE3 due to low dissolved oxygen, elevated biochemical oxygen demand, total ammonia and unionised ammonia. Flow in this stream is low. Investigations will be carried out to identify the causes of downgrading.

Wriggle

The stretch, Confluence with Beer Hackett Stream - Confluence with Yeo, marginally failed to comply with its long term RQO of RE2 due to elevated biochemical oxygen demand. The most likely cause is poor water quality input from Beer Hackett Stream. We are carrying out a farm pollution prevention survey and further investigations are planned.

Sutton Bingham Stream

The stretch Higher Halstock - d/s Sutton Bingham Reservoir significantly failed to comply with its long term RQO of RE2 due to low dissolved oxygen and marginally failed to comply with its long term RQO due to elevated biochemical oxygen demand. The reason for this is to be investigated.

The stretch, Downstream Sutton Bingham WTW - Confluence with Yeo, marginally failed to comply with its long term RQO of RE2 due to biochemical oxygen demand. This may be partly caused by agricultural runoff. Investigations into other causes of the downgrading will be undertaken.

Closworth Stream

The stretch, Princes Place - Confluence with Sutton Bingham Stream, marginally failed to comply with its long term RQO of RE2 due to biochemical oxygen demand, possibly caused by diffuse agricultural runoff.

River Isle

The stretch, Chard STW - Dunpole Farm, significantly failed to comply with its RQO of RE3 (2000) due to unionised ammonia and marginally failed to comply with its RQO due to total ammonia. River water quality in this stretch is impacted by Chard STW. A new STW is to be built at Chard by WWSL under the AMP2 programme which will improve water quality in this stretch.

South Petherton Stream

The stretch, Source - Confluence with Lambrook Brook, significantly failed to comply with its long term RQO RE3 due to low dissolved oxygen. We will undertake investigations to establish the cause. As South Petherton STW contributes greatly to the flow of the stream this works is one likely cause.

Hinton Meads Brook

The stretch, Hurst - Confluence with Wellhams Brook, significantly failed to comply with its RQO of RE3 (2000) due to elevated biochemical oxygen demand and low dissolved oxygen concentrations. River water quality in this stretch is impacted by Martock STW. The discharge for this STW will be relocated to the main River Parrett under the AMP2 programme. We anticipate that this will improve water quality in the Hinton Meads Brook.

Lopen Brook

The stretch, Easterdown Hill - Confluence with Parrett, significantly failed to comply with its long term RQO RE3 due to elevated levels of unionised ammonia and marginally failed to comply with its long term RQO due to elevated total ammonia. An investigation into the causes of downgrading will be carried out.

Parrett Tributary

The stretch, Tributary of River Parrett Bagnell Farm - Confluence with Parrett, marginally failed to comply with its RQO of RE2 (1999) due to elevated biochemical oxygen demand and total ammonia. River water quality in this stretch has only been monitored since 1994. We suspect the cause of downgrading was because of a poor quality effluent from the Odcombe landfill site. Recent improvements to the effluent containment facilities at this site should eliminate any further problems. Recent monitoring data (1995) shows compliance with the target of RE2.

In addition the sampling point is not representative of the whole Parrett tributary so we will establish a new monitoring point nearer the confluence to reflect quality in the lower reach.

Chinnock Brook

The stretch, East Chinnock - Confluence with Parrett, marginally failed to comply with its RQO of RE3 due to elevated biochemical oxygen demand. The non-compliance is due to one sample as a result of a pollution incident in 1993 which resulted in a prosecution. Our investigatory survey in 1995 and farm survey in 1996 identified a number of farms where improvements were required. These are now being addressed.

ISSUES - Non-compliance with RQOs

Issue 1 - Impact of septic tanks on water quality.

Stretches where septic tank effluents caused non-compliance with the RQO are listed below:

1 Stogursey Brook - Stringston to sea (2 stretches). Marginal non-compliance with RE2.

Options for Action

1 A 1993 survey found several septic tank discharges which have mostly been resolved. A follow up survey will be conducted to ensure outstanding works have been completed.

Issue 2 - Impact of farming activities on water quality.

Stretches where farming activities caused a non-compliance with the RQO. Farms may cause non-compliance by both point source and diffuse pollution see Section 6.12.

1 Stogursey Brook - Stringston to sea (2 stretches). Marginal non-compliance with RE2.

2 Stogursey Brook - Doddington to Stogursey. Marginal non-compliance with RE2.

3 Cannington Brook - Blackmore Farm to Bradley Green. Significant non-compliance with long term RQO RE2 (2000).

4 Cary - Lovington to Higher Farm. Significant non-compliance with long term RQO of RE3.

5 Yeo - Milborne Wick to Milborne Port. Significant non-compliance with RQO of RE2.

6 Yeo - Milborne Port to upstream Sherborne Lake. Marginal non-compliance with long term RQO of RE2.

7 Cam - Queen Camel to confluence with Yeo. Marginal non-compliance with long term RQO of RE2.

8 Wriggle - Confluence with Beer Hackett Stream to confluence with Yeo. Marginal non-compliance long term RQO of RE2.

9 Sutton Bingham Stream - Downstream Sutton Bingham WTW to confluence with Yeo. Marginal non-compliance with long term RQO of RE2.

10 Closworth Stream - Princes Place to confluence with Sutton Bingham Stream. Marginal non-compliance long term RQO of RE2.

11 Chinnock Brook - East Chinnock to confluence with Parrett. Marginal non-compliance with its RQO of RE3.

Options for Action

1 & 2 A farm survey is planned to ascertain whether improvements are required to effluent containment.

3 A significant farm input has been identified which most probably caused this non-compliance. This discharge has now ceased and a long term improvement in water quality is expected.

4 Farm survey planned in year 1997/98 to regulate consented discharges and promote Code of Good Agricultural Practice.

5 Investigations are underway in Milborne Port to determine pollution sources which will be regulated when found. Point sources above the town are also to be investigated in 1997/98.

6 Investigative and remedial work in the river stretch upstream due in 1997/98 may effect improvement on this stretch also. Agricultural inputs from Purse Caundle will be investigated in 1997/98.

7 An investigation into possible farm discharges is planned in 1997/98. Investigations have already suggested some point source contamination.

8 Recent farm pollution prevention campaign will be followed up in 1997/98 with regulation of farm discharges to the Beer Hackett Stream.

9 Investigations into point source package sewage treatment plant discharges and diffuse agricultural discharges will be planned for in the next 18 months.

10 Investigations into possible agricultural runoff are planned for in the next 18 months. Code of Good Agricultural Practice to be promoted.

11 Ensure the farms identified put in the necessary improvements in 1997. Continue to monitor brook to ensure classification compliance.

Issue 3 - Impact of STWs on water quality.

The impact of STWs caused non-compliance with the RQO in these stretches:

1 Stogursey Brook - Stogursey to confluence with Stringston tributary. Marginal non-compliance with RE2.

2 Fiddington Brook - Source to Horn Hill. Inconsistent compliance with long term RQO of RE2 (2000).

3 Cannington Brook - Cannington to confluence tidal Parrett. Significant non-compliance with long term RQO of RE2.

4 Petherton Stream - North Petherton to confluence with Parrett. Inconsistent compliance with long term RQO of RE3. Extra investment may be required at North Petherton STW.

5 River Isle - Chard STW to Dunpole Farm. Significant non-compliance with RQO of RE3 (2000).

6 South Petherton Stream - Source to confluence with Lam Brook. An investigation will establish a likely cause of significant non-compliance with long term RQO of RE3.

7 Hinton Meads - Hurst to confluence with Wellhams Brook. Significant non-compliance with RQO of RE3 (2000).

Options for Action

1&4 Further investigations will be undertaken to determine the reasons for non-compliance and we can liaise closely with Wessex Water should it be confirmed that Stogursey STW and North Petherton STW are having an adverse impact.

2&3 Investment may be required at Nether Stowey STW and Cannington STW in AMP3 to ensure the long term RQO is sustainable on the respective stretch.

5 Improvements should be noted when the new STW becomes operational.

6 South Petherton STW contributes greatly to the flow of this stream. We will undertake further investigations in 1997 to confirm the cause and we can liaise closely with Wessex Water on this issue.

7 Anticipate improvements to the water quality in the Hinton Meads Brook once the STW outfall is relocated.

Issue 4 - Unknown causes of non-compliance with River Quality Objectives.

We do not yet know the cause of RQO non-compliance in these stretches:

1 Parrett - Confluence with Crewkerne Stream to confluence with Broad River. Marginal non-compliance RE2 long term.

2 Parrett - Confluence with Broad River to confluence with Chinnock Brook. Marginal non-compliance RE2 long term.

3 Yeo - upstream Sherborne Lake to Sherborne STW. Significant non-compliance with long term RQO RE2.

4 Yeo - Sherborne STW to confluence with Wriggle. Significant non-compliance with long term RQO RE2.

5 Yeo - Confluence with Wriggle to confluence with Sutton Bingham Stream. Marginal non-compliance with long term RQO of RE2.

6 Corton Denham Stream - Rimpton to confluence with Yeo. Marginal non-compliance with long term RQO of RE3.

7 Sutton Bingham Stream - Higher Halstock to downstream Bingham Reservoir. Significant non-compliance with long term RQO of RE2.

8 Sutton Bingham Stream - Downstream Sutton Bingham WTW to confluence with Yeo. Marginal non-compliance with long term RQO of RE2.

9 Lopen Brook - Easterdown Hill to confluence with Parrett. Significant non-compliance RQO of RE3.

Options for Action

1 & 2 A survey will be undertaken in 1997 on both these Parrett stretches to determine whether the Merriott Brook or the Crewkerne Stream are impacting on water quality.

3 Investigations into diffuse and point source agricultural discharges will be planned for 1997/98.

4 Investigations into possible impact of Sherborne STW and the disused Sherborne tip and Lake WTW will be considered in 1997/98.

5 Possible impact of River Wriggle and the Beer Hackett Stream will be considered in 1997/98.

6 Point source agricultural discharges and spreading to land together with septic tank problems in Sandford Orcas will be investigated in 1997/98.

7 Diffuse agricultural discharges will be investigated in 1997/98. Land spreading of farm waste has given problems in the past.

8 Investigations into point source package sewage treatment plant discharges and diffuse agricultural discharges will be planned for in the next 18 months.

9 We will carry out an investigation during 1997/98 to find out the causes of downgrading.

Issue 5 - Impact of industrial discharges on water quality.

Industrial discharges cause non-compliance with RQOs in these stretches:

1 Cannington Brook - Bradley Green to Cannington

2 Yeo - Milborne Wick to Milborne Port. Significant non-compliance with RQO of RE2.

Options for Action

1 A potato grading plant may still be discharging contaminated site drainage. A survey will be carried out and improvements recommended as required.

2 Investigations into possible point source contamination from the industry in and around the Business Park in the town has begun and will be completed in 1997/98.

Issue 6 - Nutrient enrichment and effect of algae on water quality.

Nutrient enrichment and algal blooms cause non-compliance with the RQO on these stretches:

1 King's Sedgemoor Drain (KSD) - Confluence with 18 Feet Rhyne to confluence with Sowy. Marginal non-compliance with long term RQO or RE2.

2 KSD - Confluence with Sowy to Bawdrip. Marginal non-compliance with long term RQO of RE3.

3 KSD - Dunball 1 to confluence with tidal Parrett. Marginal non-compliance with long term RQO of RE3.

4 Sowy - Parrett to KSD. Marginal non-compliance with long term RQO of RE4.

Options for Action

1-4 Investigations into the agricultural enrichment of the catchment leading to seasonal growth of algae will be completed in the next 12 months.

Issue 7 - Low dissolved oxygen levels in groundwater contributing to river flow.

1 Yeo - Milborne Port to upstream Sherborne Lake. Marginal non-compliance with long term RQO of RE2.

Options for Action

1 The possible impact of low DO in groundwater will be assessed by sampling in 1997/98.

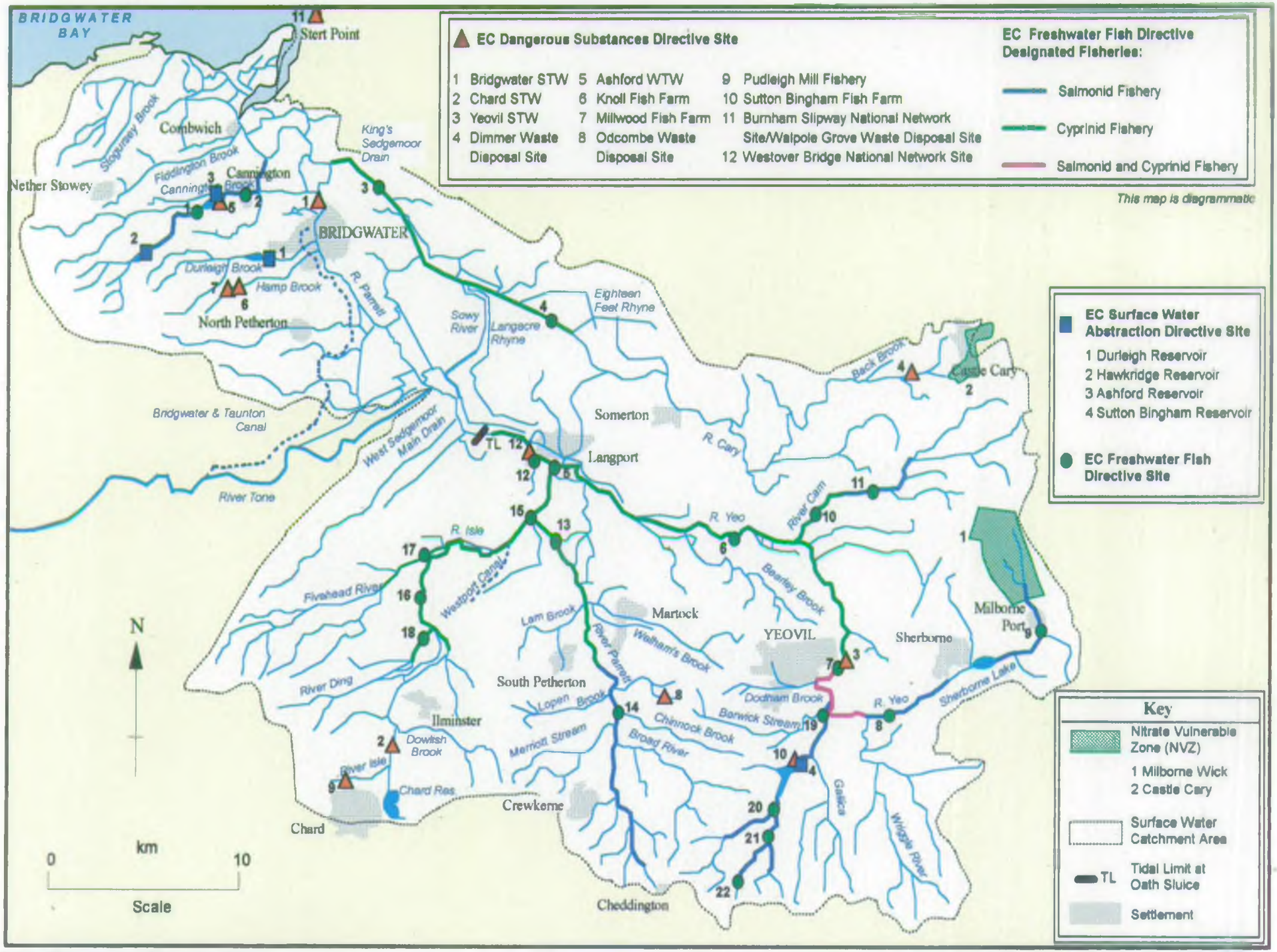
Issue 8 - Inappropriate location of monitoring point.

Monitoring locations at the following sites are not representative of water quality at the following locations:

1 Durleigh Brook - Upstream Durleigh Reservoir to confluence with Parrett. Marginal non-compliance with its RQO of RE3 (1998).

2 Parrett Tributary - Tributary of River Parrett Bagnell Farm to confluence with Parrett. Marginal non-compliance with its RQO of RE2 (1999).

Map 25 - EC Directives



Information correct as of December 1996

Options for Action

1 The monitoring site for this stretch was unrepresentative and has now been relocated.

2 An additional monitoring site will be set up this year to better represent the water quality in this stretch.

7.1.2 EC Dangerous Substances Directive (76/464/EEC)

Target - EC Dangerous Substances Directive 76/464/EEC

The 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 that contain harmful substances to rivers, estuaries and coastal waters. See Map 25 - EC Directives for Dangerous Substances Directive monitoring sites.

This Directive describes two lists of compounds. List 1 contains substances regarded as particularly dangerous because they are toxic, they persist in the environment and they bioaccumulate. Discharges containing List 1 substances must be controlled by Environmental Quality Standards (EQSs) (see Glossary - Appendix 2) issued through Daughter Directives. List 2 contains substances which are considered to be less dangerous but which can still have a harmful effect on the water environment. Discharges of List 2 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 which receive discharges containing 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.

State of the Environment

List I Substances

There are two National Network sites for the routine monitoring of Dangerous Substances in the Parrett Catchment: River Parrett, Westover Bridge and River Parrett, Burnham Slipway. These sites should detect inputs of water-borne pollutants arising anywhere in the catchment from both point and diffuse sources. Five additional sites are monitored for List I substances in the Parrett Catchment because these substances are included in the consent to discharge. These are shown in Table 9.

Table 9: Sites monitored for List I substances

Site	Substance(s) monitored
Bridgwater STW	Cadmium, HCH
Chard STW	Cadmium
Yeovil STW	Cadmium, HCH
Walpole Drove Waste Disposal Site	Mercury, cadmium, HCH, aldrin, dieldrin, endrin
Dimmer Waste Disposal Site	Mercury, cadmium, HCH, aldrin, dieldrin, endrin

There have been **no EQS exceedances** in the receiving waters at the following sites in the period 1992 to 1994: Chard STW, Yeovil STW and Dimmer Waste Disposal Site.

There was an EQS exceedance in the receiving water for this site for total HCH in 1993. The most likely source is the WWSL consented trade effluent discharges of cadmium and HCH to Bridgwater STW.

There was an EQS exceedance for mercury at Westover Bridge in 1992. This was found to be due to one sample containing an abnormally high level of mercury. An investigation revealed that there were no obvious sources of mercury. The sample was not subject to contamination during sampling or analysis. Sediment sampling has show no significant inter-year changes in mercury levels.

List II Substances

Eight sites are monitored for List II substances in the Parrett Catchment: Ashford Water Treatment Works, Dimmer Waste Disposal site, Knoll Fish Farm, Millwood Fish Farm, Odcombe Waste Disposal site, Pudleigh Mill Fishery, Sutton Bingham Fish Farm and Walpole Drove Waste Disposal site. **There have been no EQS exceedances at any of these sites in the period 1992 to 1994.**

Issue 9 - Non-compliance with EC Dangerous Substances Directive.

1 Stretch downstream of Bridgwater STW - EQS for HCH (lindane) exceeded in 1993.

2 Westover Bridge - EQS exceeded for mercury in 1992.

Options for Action

1 Discuss HCH trade discharges with WWSL to agree an improvement plan if these discharges are found to be the cause of the exceedance.

2 Continue to sample sediments at Westover Bridge to determine whether mercury contamination levels are changing.

7.1.3 EC Freshwater Fish Directive 78/659/EEC

The Freshwater Fish 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.

Target - EC Freshwater Fish Directive

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.

There are two sets of standards for each fishery type: imperative standards, which must be achieved and guideline standards that Member States should aim to achieve.

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.

State of the Environment

Map 25 shows the designated salmonid and cyprinid stretches in the Parrett Catchment. Eight salmonid and three cyprinid stretches exceeded the imperative standards in the period 1992 to 1994. Reasons for non-compliance are shown in Table 10.

Table 10: Details of Non-compliance with Imperative Standards of the EC Freshwater Fish Directive

River	Stretch	Length (km)	Monitoring Point	Failing Determinands	Year	Reason for Failure
Parrett (salmonid)	South Perrott - A303 Road Bridge	12.1	Chiselborough 53001700 ST 461 144	Dissolved Oxygen Total Ammonia	1993 1992 1992	Low summer flows provide little dilution for farm, STW and other consented discharges. A farm survey carried out in the Upper Parrett Catchment between 1992 and 1993 did not identify any polluting inputs.
Yeo (salmonid)	Milborne Wick - u/s Sherborne Lake	7.3	Goldings Lane 54001200 ST 676 183	Dissolved oxygen Total ammonia Unionised ammonia	1992	Problems have been associated with diffuse farm inputs resulting from irrigation of waste. The failures occur following rainfall after prolonged dry spells. Farm site visits were carried out with the farmers agreeing not to irrigate waste on fields in vulnerable locations.
Yeo (salmonid)	Sherborne - A30 Road Bridge Yeovil	12.2	Thornford 54002500 ST 603 138	Dissolved oxygen	1992	Probable cause was low river flows during May. During this month no rainfall was recorded until 28/5/92 (the day of the low dissolved oxygen result) when 4.3 mm of rain fell. It is likely this rain caused the input of poorly oxygenated water from ponded tributary streams.

Table 10 continued

River	Stretch	Length (km)	Monitoring Point	Failing Determinands	Year	Reason for Failure
Cam (salmonid)	Confluence u/s Sparkford-West Camel	5.0	Queen Camel 54331500 ST 597 251	Dissolved oxygen Total Ammonia	1992	This site has been subject to several investigations, but no direct polluting discharges have been located. It is highly probable that the dissolved oxygen problem is associated with land runoff following heavy rainfall.
Sutton Bingham Stream (salmonid)	Chelborough Stream	3.1	Halstock 54140600 ST 543 082	Dissolved oxygen	1992	Very low flows were experienced in the stream, particularly during the summer months. The failed results all occurred after rainfall following prolonged periods of no rain in the catchment.
Sutton Bingham Stream (salmonid)	Corscombe Stream	2.9	Netherstoke 54160900 ST 543 091	Dissolved oxygen	1992	
Sutton Bingham Stream (salmonid)	Halstockleigh Stream	3.5	Farmers End 54170100 ST 520 056	Dissolved oxygen	1992	
Sutton Bingham Stream (salmonid)	d/s SB Reservoir-River Yeo confluence	4.5	Railway Bridge 54141700 ST 568 139	Dissolved oxygen	1992	

Table 10 continued

River	Stretch	Length (km)	Monitoring Point	Failing Determinands	Year	Reason for Failure
King's Sedgemoor Drain (cyprinid)	Henley Corner - Dunball Sluice	16	Crandon Bridge 55006500 ST 33 40	Total ammonia	1994 1993 1992	This is a penned watercourse on the Somerset Levels with numerous interconnecting drains. Releases of nutrient rich water after periods of penning can cause water quality problems in the main river.
				High pH Unionised ammonia	1993 1993	There is evidence to suggest that this stretch is affected by algal blooms during the summer. The high pH and unionised ammonia values correspond with times when an algal bloom would have been present.
Cary (cyprinid)	Cradle Bridge - Henley Corner	1.2	Cradle Bridge 55005500 ST 426 333	Total ammonia	1992	Despite investigations no polluting discharge that could have caused this high result was found. 25 mm of rain had fallen prior to the sample being taken.
Yeo (cyprinid)	Ilchester - River Parrett confluence	13	Bicknells Bridge 54005100 ST 428 260	Total ammonia	1992	A single failure occurred following 30 mm of rainfall in the preceding 48 hours. This increased the amount of land runoff and contributed to the failure.

Issue 10 - Non-compliance with Freshwater Fish Directive.

Eight salmonid and three cyprinid stretches exceeded the Directive standards - see Table 10 for details.

Options for Action

Yeo (salmonid) - failures in 1992 have not recurred since 1992, where possible Code of Good Agricultural Practice (COGAP) is promoted in the farming community to prevent diffuse pollution.

Cam - Again no failures since 1992 control of diffuse agricultural pollution is being promoted in the catchment to ensure compliance.

Sutton Bingham Stream - low flows in 1992 contributed to low DO failure. This has not recurred. Again compliance with COGAP is promoted where possible.

King's Sedgemoor Drain - Pollution prevention work in the agricultural industry in the catchment is currently promoting COGAP. Some point source pollution with farm waste has been addressed and should reduce enrichment of the water.

Cary and Yeo (cyprinid) - both failures in 1992 attributed to high rainfall prior to the samples being taken. These failures have not recurred since 1992 and promotion of COGAP in the agricultural industry in the respective catchments is done when possible.

7.1.4 EC Urban Wastewater Treatment Directive 91/271/EEC

The EC Directive "concerning urban wastewater 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 (see Effluent Disposal Section 6.12).

Target

We are responsible for making sure that discharges receive the level of treatment specified in this Directive.

State of the Environment

Under the Directive, Bridgwater STW will be improved (see Effluent Disposal Section 6.12 Improvements to WWSL Discharges).

7.1.5 EC Surface Water Abstraction Directive 75/440/EEC

The 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.

Target - EC Surface Water Abstraction Directive

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.

State of the Environment

There are five identified public water supply surface water abstraction points in the Parrett Catchment. These are shown on Map 21 - Surface Water Abstractions.

In 1993 Durleigh Reservoir exceeded the standards for nitrate. This failure coincided with periods of rainfall in the catchment. Runoff from surrounding land is the most probable cause.

Issue 11 - Non-compliance with the Surface Water Abstraction Directive.

Options for Action

A survey is to be carried out in 1997 to identify the possible high nitrate inputs to the reservoir. (The results will be published in the Parrett Action Plan in Autumn 1997).

7.1.6 EC Nitrates Directive 91/676/EEC

Restrictions on certain agricultural activities are necessary in areas sensitive to surface and groundwater pollution. 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 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). Action plans must be established 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 boundaries of NVZs. The designation of NVZs and agricultural measures to be adopted is the responsibility of Government.

The first NVZs were formally designated in 1996, and of six designated within this Region, those at Milborne Wick and Castle Cary lies respectively totally and partly within the area of this report see Map 25 - EC Directives. 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; reviews will then be at four year intervals. First

indications are that no additional zones will be designated in the study area, however the formal assessment will not be completed until after this publication.

The DoE intend to establish a national action plan by 1999 to include measures aimed at reducing and preventing nitrate pollution.

7.1.7 EC Habitats Directive 92/43/EEC

Target

This Directive makes provision to establish Special Areas of Conservation (SAC) to protect water quality in certain very important wildlife habitats. The Directive requires the review of discharge consents for any discharge to, or likely to affect a Special Area of Conservation. There is also a need to review consents for all discharges to, or likely to affect Special Protection Areas and Sites of Special Scientific interest for example Northmoor SSSI

State of the Environment

We do not fully understand the impact of discharges to designated conservation areas.

Issue 12 - The need to review the consents for discharges to designated conservation areas

Options for Action

We need to establish a review programme for these discharges, with discharges to SACs as a priority.

7.1.8 Annex 1A Reduction Programme

Target

At the second and third North Sea Conferences in 1987 and 1990, the UK Government made a commitment to reduce the load (load = concentration x flow) of certain harmful substances, known as 'Annex 1A' substances, entering tidal waters from rivers and direct discharges. Loads of most Annex 1A substances were to have been reduced by 50%, but loads of mercury cadmium and lead by 70%. Reductions were to have been achieved by 1995 compared to a 1985 baseline, or a 1991/1992 baseline where data for 1985 was unavailable. These reductions had not been fully achieved by the time of the fourth North Sea Conference in 1995. However, it was agreed that the reduction targets should be met by 2000.

State of the Environment

One site in the Parrett Catchment is monitored for Annex 1A purposes: the River Parrett at Westover Bridge. The Annex 1A site on a river is chosen to be as far downstream on the non-tidal part as possible in order to be representative of the total load flowing into the sea.

The loads of cadmium, copper, zinc, lead, nickel, arsenic, lindane, fenitrothion, dieldrin, and atrazine were considered for Annex 1A reductions but following DoE guidelines no further action is required other than to continue monitoring.

We anticipate that nationally, reductions in Annex 1A pesticide loads entering UK tidal waters will be achieved by the government's regulation of pesticide use.

7.1.9 Additional Monitoring

As well as the water quality issues identified through the requirements of RQOs, EC Directives and other international commitments, we have identified the following water quality problems in the Parrett Catchment.

During the demolition of a disused seed mill in Somerton, Somerset, prior to redevelopment of the site, up to 1200 litres of pesticide material containing lindane and mercury was discharged into the nearby Mill Stream. A report of pollution on 13 August 1995 resulted in Water Quality staff tracing the source to the seed mill site. An investigation established that the pesticide had probably been disposed of deliberately by pouring down a site drain which leads to the stream.

An extensive clean up operation has taken place to remove pesticide contamination from the stream. Contaminated water was initially tankered away for disposal but subsequently treated in situ using an activated carbon filter. The final phase of the clean up involved the removal of approximately 1000 tonnes of silt from the affected area to a licensed landfill site.

Following the immediate clean up operation and deployment of carbon filtration treatment, the lindane and mercury levels in the Mill Stream water remained within the Environmental Quality Standard despite heavy rainfall causing a breach in the containment dam. As a result of this operation the main River Cary was saved from a serious pollution. This remains the case to date and monitoring of the Mill Stream and River Cary is continuing to ensure further improvements in water quality.

This incident seriously affected the biota in the Mill Stream for some distance downstream. Monitoring of recovery includes an examination of recolonisation and this programme will be necessary for at least 2 years to confirm full ecological recovery.

The Agency's costs to date are in the region of £500k and are approximately one hundred times the cost of correct disposal of the waste chemicals.

7.1.10 Freshwater Biology

We monitor the ecological quality of rivers by sampling the benthic aquatic macro invertebrates. These are the 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. We use this biochemical information to classify rivers using the new Biology classification scheme. See Table 11.

Target

We collect samples from the river during spring, summer and/or autumn and we list the different families or taxa of macro invertebrates found. We then use the Biological Monitoring Working Party (BMWP) system to assign a score to each family. This score reflects the tolerance of a particular family to pollution. We then use this information to calculate the Average Score Per Taxon (ASPT) which varies according to the levels of pollution in the river. We then compare the number of families found and the ASPT value to predicted scores for an unpolluted river using a computer model called the River Invertebrate Prediction and Classification System (RIVPACS) developed by the Institute of Freshwater Ecology. The ratio of observed and predicted ASPT and number of taxa (N-taxa) is called the Ecological Quality Index (EQI) and is used to classify rivers as follows:

Table 11: Biological Classification Scheme

Biological Class	Description	Lower Class Limits	
		EQI- ASPT	EQI-N-taxa
a	Very good	1.00	0.85
b	Good	0.90	0.70
c	Fairly good	0.77	0.55
d	Fair	0.65	0.45
e	Poor	0.50	0.30
f	Bad	0.00	0.00

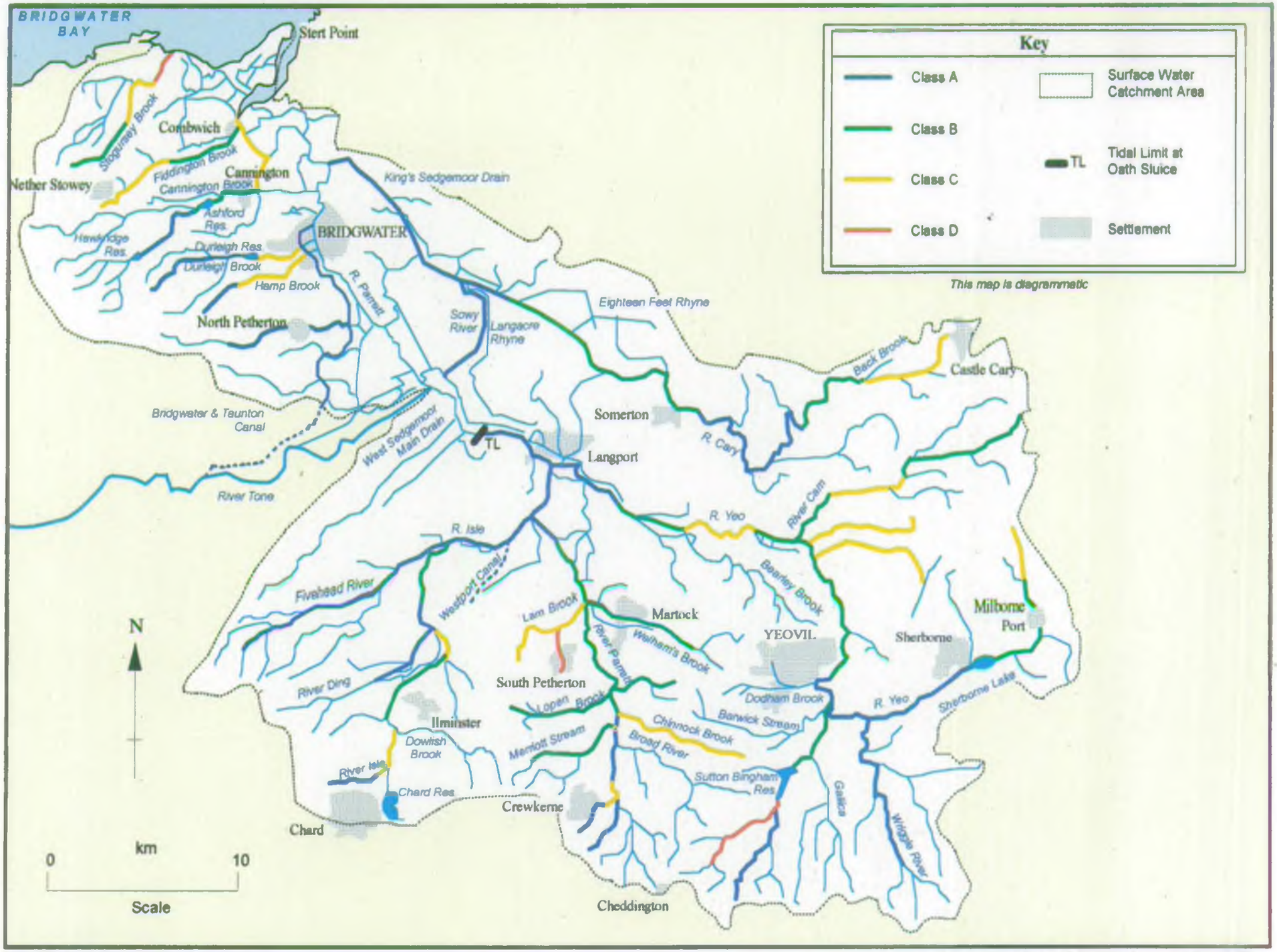
In 1995, we classified 79 sites in the Parrett Catchment using this scheme.

State of the Environment

Of the 79 sites in the Parrett Catchment, 33 achieved class a (very good), 23 sites achieved class b (good), 20 achieved class c (fairly good), and 3 sites achieved class d (fair). One of the sites, upstream of Sutton Bingham Reservoir, classified as class d would appear to be the result of unusual conditions in spring when the site was flooded due to high reservoir levels. All other results from this site indicates that it should achieve class a in normal circumstances.

A number of sites in the catchment showed evidence of nutrient enrichment. This is indicated by the presence of filamentous algae (*Cladophora*), and duck weed (*Lemna*), and sometimes blooms of algae, coupled with fair or fairly good biological class. We observed this evidence in particular on the Stogursey Brook, Cannington Brook, Lam Brook, the upper reaches of the Isle, and upper Yeo (including tributaries). In these areas evidence of nutrient enrichment was widespread suggesting that both diffuse sources and point source discharges contribute to the overall level of nutrients in the catchment. The sites do not qualify for sensitive waters (eutrophic) status under the Urban Waste Water Treatment Directive.

Map 26 -Biological Classification, 1995



Information correct as of December 1996

A number of sites in the catchment dried during the drought of summer 1995, causing a loss of biota and apparent deterioration in biological water quality. These included sites in the upper Yeo above Milborne Port, Back Brook near Castle Cary, and Fivehead River. We would not expect poor biological quality in normal years when flow is maintained in these watercourses.

We have compared the biological survey results for the catchment from 1995 to those achieved in 1990. This comparison appears to show a widespread improvement in biological quality, notably in the Lam Brook, Cannington Brook, Durleigh Brook, Upper Yeo and River Parrett. These improvements may be partly explained by improvements in our methods.

Issue 13 - Biological indication of degraded water quality.

1 Three sites in 1995 showed class d fair quality. The results for upstream of Sutton Bingham reservoir can be discounted (see above).

The two remaining class d sites are:

(i) the Stogursey Brook at Stolford Bridge
(ii) the South Petherton Stream at East Lambrook

2 Widespread evidence of nutrient enrichment on

(i) Stogursey Brook
(ii) Cannington Brook
(iii) Lam Brook
(iv) Upper Parrett
(v) Upper Yeo and tributaries

Also see Issue 6 - Nutrient enrichment and effect of Algae on water quality.

3 The Stogursey Brook deteriorated biologically between the 1990 survey and that in 1995.

Options for Action

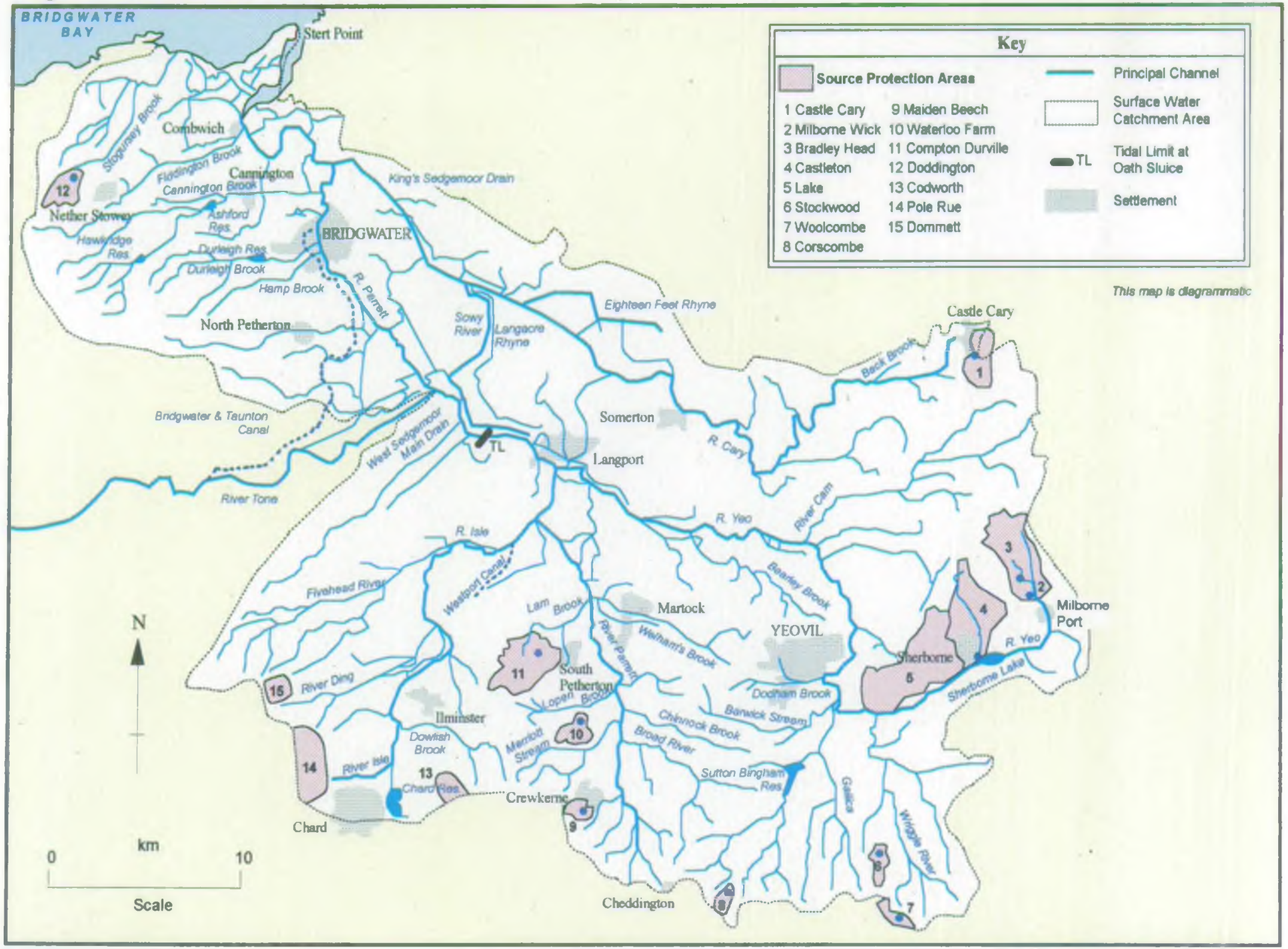
1 (i) Septic tank inputs are suspected to be the cause of poor water quality at this location. Several known problems have been resolved. Other discharges need to be located and improvements recommended.

(ii) See Issue 3, Option for Action 6.

2 Investigate the sources of nutrient inputs to these watercourses and take appropriate action depending on the source.

3 Continue to press for improvements to septic tank discharges and continue farm campaigns to reduce agricultural nitrate pollution.

Map 27 - Groundwater Source Protection Areas



Information correct as of May 1996

7.1.11 Groundwater Quality

Groundwater stored in water bearing rocks (aquifers) is a valuable resource for future generations. In many places it is the principal source of public and private drinking water and is also used for industrial agricultural purposes. Groundwater also provides spring flow to streams and rivers maintaining flows in dry summer conditions.

If groundwater becomes polluted it is not easy to detect and is very difficult and expensive to clean up again. It is better to prevent or reduce the risk of groundwater contamination in the first place rather than deal with the consequences. We have a target to protect groundwater from pollution.

Target

In 1992 we published our Policy and Practice for the Protection of Groundwater. This is a national policy which ensures that there is a consistent approach to the prevention of groundwater pollution. The policy document sets out why we must safeguard the quality and flow of water in aquifers and outlines how the Agency will work to reduce the risk of groundwater pollution, and in many cases must seek the co-operation of other organizations and individuals. LEAPs need to address the importance of pollution prevention planning in achieving and maintaining future groundwater quality. A golden rule is that prevention is better than cure.

Our Policy document contains policy statements on the following:

- Control of groundwater abstractions.
- Physical disturbance of aquifers affecting quality and quantity.
- Waste disposal to land.
- Contaminated land.
- Disposal of sludges and slurries to land.
- Discharges to underground strata.
- Diffuse pollution.
- Other threats to groundwater quality.

The full Policy document is available from HMSO.

The Policy pays particular attention to protecting groundwater used for public water supply and the Agency is working on defining three zones of decreasing risk around points of abstraction. These should be completed by 1998. In the meantime we are also defining 'Consultation Zones' around such sources and will ask planning authorities to refer certain types of development proposals to us.

Another key element to assist the protection of groundwater generally is identifying areas which are particularly vulnerable according to properties of the soil cover and the underlying rocks. A programme of Groundwater Vulnerability mapping is well underway and will assist in future pollution prevention planning.

State of the Environment

The Groundwater Source Protection Areas Map - Map 27 shows public groundwater supply 'Consultation Zones' within the catchment. The Agency carries out only limited groundwater quality monitoring itself, although a national monitoring strategy is being developed. Public groundwater supplies are monitored by water companies and their data is made available to the Agency. Private groundwater supplies are monitored by district councils.

A nationally recognised groundwater pollution problem is that of high nitrate levels in certain public supplies although none have been identified in this catchment. There are two Nitrate Vulnerable Zones within the catchment:

(i) Milborne Wick
(ii) Castle Cary

See Section 7.1.6 for details of how this designation will lead to reductions in pollution.

NVZ designation does not extend to private drinking water supplies.

There is no indication that the various sites mentioned in Section 6.7 - The Management of Waste, have caused off site pollution of groundwater.

7.2 WATER QUANTITY

We aim to manage water resources to achieve the right balance between the needs of the environment and those of the abstractors. In this section we will assess the state of water resources in the catchment. We will consider how the water environment is affected by abstraction and look at the needs of the abstractors. In particular we will discuss the obligations we have to ensure that there is adequate water for public supply.

The NRA publication now adopted by the Agency, South Western Regional Water Resource Development Strategy (RWRDS) - 'Tomorrow's Water' sets out how we would like to see water resources developed in the future. Our Strategy follows the principles of sustainable development with proper safeguards for the environment.

To promote our strategy for the region we will:

- encourage the efficient use of water;
- expect abstractors to use existing sources efficiently before new sources are developed;
- approve developments that cause the minimum problems for the environment;
- study rivers stressed by abstraction and solve existing environmental problems where benefits outweigh the costs and funds can be found.

Here are three examples of our approach to managing water resources in the catchment:

- We plan for the sustainable development of water resources, developing criteria to assess the reasonable needs of abstractors and the environment.
- We plan the future use of water on the basis that water supply companies reduce leakage to an acceptable level and make best use of available resources.
- We study the spending plans of the water supply companies (Wessex Water Services Ltd - WWSL in this catchment) - known as Asset Management Plans (AMP) - to ensure that these plans do not overlook opportunities to improve flows in rivers which are stressed by abstraction.

'Tomorrow's Water' includes current and future demands for public water supply calculated at supply zone level. In contrast, data on company resources is available at catchment level. The resource-demand balance for the Somerset Supply Zone includes the Parrett Catchment. However, resolution of the demand figures does not permit a catchment wide balance to be made. Since the Parrett Catchment contains sources that are of strategic importance to WWSL then the following assessment of issues at the zonal scale illustrates the future water supply actions that will affect the Parrett. At present there are no known local issues related to public water supply sources in this catchment.

7.2.1 The Natural Water Environment

Target - To protect the water environment from damage caused by abstraction.

State of the Environment

Compared with the catchment's annual natural water resource (1126 Ml/d) the volume of licensed surface and groundwater abstraction (155.5 Ml/d - average daily figure derived from annual authorized quantities) does not give cause for concern at a strategic level. We are not aware of catchment scale environmental damage in the Parrett Catchment caused specifically by abstraction. However, we are aware of a number of small isolated issues at the local scale. Not all of these require specific action by the Environment Agency or are solely within our control.

Target - To achieve optimised use of abstracted water on the Levels and Moors.

State of the Environment

The River Parrett can cease to discharge to the tidal reaches in summer. We need to balance the needs of the river with the requirement for water within the Somerset Levels and Moors.

Issue 14 - Optimisation of water resources on the Somerset Levels.

There is a need to optimise the use of water resources on the Somerset Moors in conjunction with the requirements of the IDBs. Improved understanding of the water management systems and better control of their operation would ensure best use of the available resources and minimise the diversion of water from the principal rivers and drains during dry weather.

Options for Action

Investigate the possibility of 'fine-tuning' the take of water to the Levels and Moors so that only enough water for immediate need is taken.

Target - To collect flow data from the Lower Parrett to aid effective resource planning.

State of the Environment

Lack of a primary gauging station in the lower reaches of the River Parrett restricts our ability to: undertake effective resource planning; set measurable conditions for abstraction licences; carry out our enforcement duties efficiently; and prevents us from providing flow data to other Environment Agency functions

Issue 15 - Lack of a gauging station in the Parrett lower reaches.

Options for Action

Examine the benefit and feasibility of installing a primary gauging station and recording facility at an appropriate site downstream of Langport.

Target - To ensure an adequate flow downstream of Ashford Reservoir.

State of the Environment

Cannington IDB and downstream farmers are concerned about the reduced flow downstream of Ashford Reservoir as a result of operational changes at the treatment works following the commissioning of a direct main from Hawkridge Reservoir.

Issue 16 - Reduced flow downstream of Ashford Reservoir.

Options for Action

Investigate the possibility of changing the operation of the Ashford system licences along with other licences in this subcatchment, within existing licence constraints, with a view to improving flows downstream of Ashford Reservoir.

Target - To ensure equitable use of the King's Sedgemoor Drain resource during low flow conditions.

State of the Environment

Under low flows abstraction can be greater than in flow. Under these conditions environmental damage could occur unless the water resource is managed effectively.

Issue 17 - Low flow abstraction problems from the King's Sedgemoor Drain.

Abstraction from the King's Sedgemoor Drain by Royal Ordnance Plc during low flow conditions may cause operational difficulties for other abstractors such as UCB Cellophane Ltd.

Options for Action

Discuss operational practice with the licence holders regarding the use of this source.

Target - To ensure abstraction from the Yeo does not cause a reduction in water quality.

State of the Environment

There is a deterioration in water quality of the River Yeo between Sherborne Lake and Clifton Maybank during the occasional augmentation periods to support abstraction to Sutton Bingham reservoir.

Issue 18 - Impact on water quality of River Yeo abstraction.

Options for Action

Agree operating rules with WWSL where appropriate to ensure releases are made in such a way as not to cause a deterioration in water quality.

7.2.2 Public Water Supply

Target - To ensure that there is enough water available for public water supply now and in the foreseeable future.

State of the Environment

To meet the forecast demand in South West region we need to consider how water resources could be developed in this catchment. The current level of demand in WWSL's Somerset Supply Zone is forecast to rise from 124 Ml/d to 175 Ml/d by 2021 assuming the current level of metering and leakage control with high growth in domestic, industrial and commercial consumption. Should domestic, industrial and commercial consumption growth be somewhat slower and WWSL reduce leakage to 120 litres per property per day then demand is forecast to rise to 131 Ml/d by 2021. WWSL supplies the Somerset via a grid system of pipes which interconnect approximately 50 licensed water sources. As demand fluctuates sources are taken in or out of supply to this grid.

Issue 19 - Securing future public water supplies in the Somerset Supply Zone.

WWSL meets this current demand by importing 9 Ml/d of water to the Zone from Wimbleball reservoir, Otterhead Lakes, Forches Corner springs and adits and groundwater sources in Wiltshire. In the lower demand forecast scenario by 2021 16 Ml/d will have to be imported and in the higher scenario 60 Ml/d. There is a need to ensure that in meeting any extra demand for water, harm to the environment is minimal.

Options for Action

To meet any shortfall in local resources or to alleviate stress on resources our Regional Water Resources Development Strategy lists the following options in descending order of preference:

1) Demand management.
2) Resource management.
3) Resource development.

We need to work with WWSL to ensure the optimum management of water resources.

7.2.3 Private water use

Target - The Environment Agency must have regard to the future need for water from private abstractions.

State of the Environment

The section Water Abstraction and Supply - Section 6.11, shows that at the vast majority of licensed abstractions for purposes other than public water supply are non-consumptive. Since most of these licences are under-utilised there is no cause for concern in the short-term.

A greater cause for concern may arise in the long-term future as demand from private abstractors rises. Our Regional Water Resources Development Strategy assumed growth rates for the volumes of private abstraction licences to the year 2021. Spray irrigation demand is predicted to grow at 1.7% per annum to 2001 and at 1% from 2002 to 2021. Industrial licensed uses are predicted to grow at 0.75% per annum. The other uses, namely non-mains domestic supply, agriculture, commercial, public service and fish farms are predicted to have zero growth to 2021.

These growth rates have been applied to the appropriate figure for the total averaged licensed abstraction volume and the percentage not returned (both from Table 4). This gives a value of just under 10 Ml/d for the net resource commitment in 2021. The current commitment is 8.1 Ml/d. There is also a peak demand for individual uses dependent not only on seasonal effects but on the type of use itself. Since peak demands for each use do not always coincide it is more appropriate to use an average daily figure derived from the licensed annual quantity.

We are confident that the future needs of the existing licensed private abstractions can be met since the just under 2 Ml/d increase could be met by either full utilisation of existing licensed quantities or an equivalent increase in new licensed quantities. It is possible that there might be local environmental problems associated with full take up of the few consumptive private abstractions in the Parrett. The Environment Agency will continue to monitor the net commitment to private water abstractions and have a regard to the amount of licensed volume take up and its effects.

Future new abstraction needs will be addressed in the standard way through the abstraction licensing procedure. We encourage private abstractors to reduce their usage of water which will both result in lower bills and reduced impact on the environment.

7.3 FLOOD DEFENCE AND CONSERVATION

The major impact on the catchment has been the requirements of flood defence, land drainage and water level management. The Somerset Levels & Moors part of the catchment provide a vital flood storage area for water draining from the upland areas of the catchment.

We manage flood defence by setting target standards, measuring existing standards, and addressing the difference; we also have a duty to protect and manage rivers and wetlands to ensure that they are not degraded.

Serious floods occur less often than minor floods. The term 'return period' describes how often a flood might occur. For example a ten year return period flood will be equalled or exceeded on average once every ten years. The standard of flood protection at a location is the worst flood (expressed as a return period) which can be withstood without significant flooding of property. Flood defence schemes only alleviate flooding up to the design standard, a more serious flood may still occur.

We have a statutory duty to conserve and enhance rivers and wetlands. However, we do not have control over the way that land is developed and managed, but we can influence many of the factors which affect the quality of the water environment. Drainage standards, for example, have a major impact on land use and have contributed greatly to the increase in arable land within the catchment. We have a duty to conserve wildlife when we carry out flood defence work and design capital schemes. This includes investigating the scope for changing existing practices to benefit wildlife.

The need for a strategic review of flood defence practices, and the Agency's duty, in partnership with English Nature, towards the conservation of biodiversity in rivers and wetlands are the over-riding issues within the Parrett Catchment. These considerations will set the framework for how the Environment Agency will deal with the following matters.

Flood defence and conservation issues in the catchment are described below under the following topic headings:

7.3.1 Water Level Management of the Levels and Moors
7.3.2 Biodiversity
7.3.3 Priority Management
7.3.4 River Maintenance
7.3.5 Privately Owned Sluices and Hatches
7.3.6 River Restoration
7.3.7 Parrett Relief Channel Operation
7.3.8 Desilting
7.3.9 A Parrett Barrage
7.3.10 Pumping
7.3.11 Floodbanks
7.3.12 Recreational use of Agency Owned Land
7.3.13 Regulation
7.3.14 Urban Development
7.3.15 Wetland Archaeology
7.3.16 River Valley Landscapes

7.3.17 River Corridor Visual Amenity
7.3.18 Emergency Response

7.3.1 Water Level Management of the Levels and Moors

The Somerset Levels and Moors, occupying a significant proportion of the Parrett Catchment, have been acknowledged as wetlands of international importance through their proposed designation as Special Protection Area(SPA)/RAMSAR sites. This places particular obligations on the Environment Agency, as one of the principal organizations with control over the management of water levels. Also designated as an Environmentally Sensitive Area (ESA) by MAFF in 1987, the positive management of water levels to benefit wetland wildlife is now supported through grant aid mechanisms, principally Tier 3 payments and grants to assist with works identified as necessary under Water Level Management Plans (WLMPs).

The Levels and Moors have retained much of their unique landscape character, but the cumulative effects of drainage and subsequent changes in land management over the past 50 years are becoming apparent through the decline in biodiversity and shrinkage of peat soils. Pumped drainage schemes are expensive to maintain, and compromise the ability of the floodplain to function as it should, cleansing and storing flood waters and thus protecting developed areas downstream. The NRA recognised these issues and launched its Somerset Levels and Moors Water Level Management and Nature Conservation Strategy in 1991 (see Appendix 3 for summary). Fundamental to the implementation of the strategy is an overall review of the water level management practices within the Levels and Moors, which will be achieved by a number of different mechanisms working in parallel.

Target - Agree water level management of the Levels and Moors

To operate and maintain water levels within the moors reach of the Parrett Catchment in a manner known to and agreed by all interested parties.

State of the Environment

The current methods of maintaining and operating water levels are based on custom and practice, modified by many local and national policies, needs and experience. In the light of our duties towards sustainable development, providing value for money, and the furtherance and promotion of nature conservation, an overall review and statement of the justification for such practices is essential. Such a review needs to include a strategic environmental assessment of the impact of current practices and any proposed changes. This is particularly important given the recognition that the Levels and Moors wetlands are of international importance.

An overall strategy is required, to enable us to operate the drainage system efficiently and with the understanding and agreement of all interested parties.

Issue 20 - The need to review water levels on the Moors.

We need to review, justify and state the agreed management of water levels within the Somerset Levels and Moors as a whole.

Options for Action

We will review and state our operational strategy for the whole Levels and Moors for consultation with all interested parties, using the Sowy River model and results from the study of maintenance practice (when complete) by January 1998.

Target - Water Level Management - Moorland SSSIs

To manage water levels in a balanced way for farming, flood defence and wildlife in SSSIs.

State of the Environment

Water Level Management Plans (WLMPs) are to be produced for eight SSSIs within the catchment where EN have identified the need, in accordance with MAFF guidelines. These are North Moor, King's Sedgemoor, Langmead and Weston Level, Moorlinch, Wet Moor, West Moor, West Sedge Moor and Southlake and parts of Bridgwater Bay.

Issue 21 - The need for Water Level Management Plans.

WLMPs are required by 1998 for those SSSIs where water levels are managed.

Options for Action

We are not the lead Agency in the management of SSSIs but will work closely with EN, IDBs and others over the production of WLMPs to phase in management of water levels sympathetic to the interests of the area with particular regard given to wetland wildlife.

North Moor WLMP will be prepared by the Environment Agency. The relevant Internal Drainage Boards will prepare the rest and we have prepared interim statements on our influence.

Target - To reduce the ecological impact of the penning of main rivers

State of the Environment

The management of water levels in main rivers within the Levels and Moors area of the catchment can lead to ecological problems. The penning of levels in summer (a historical practice which has operated in Somerset since the 1770s to provide wet fences and water for stock) keeps the river levels high but reduces flow. This allows aquatic plants to flourish, thus leading to low oxygen levels which can result in some fish kills in hot, dry summers. Lowering the levels in winter to accommodate floodwaters can result in some rhynes drying out completely, causing fish kills and frost damage to sensitive aquatic communities in cold, dry winters.

Issue 22 - The need for flexible operation of the penning of main rivers.

The inflexibility in the way the penning system is operated can lead to fisheries and ecological damage in unusual weather conditions.

Options for Action

We will undertake a study to investigate the problems caused by low winter ditch levels in dry winters, and high summer levels and identify options for ameliorative action where practicable.

Target - To develop more Raised Water Level Areas

State of the Environment

As a step towards balancing the interests within the Levels and Moors, wet grassland raised water level areas (RWLAs) are being developed in association with MAFF, under the ESA scheme.

The promotion of RWLAs is funded by our flood defence capital programme and through grant from MAFF as works in association with main river. Within the Parrett Catchment and its tributaries there are now RWLAs covering a total of 1147 ha as follows:

Wet Moor	265 ha	(655 acres)
West Moor	77 ha	(190 acres)
Southlake	44 ha	(108 acres)
Walton Moor	113 ha	(279 acres)
Hay Moor	13 ha	(32 acres)
West Sedge Moor	340 ha	(840 acres) RSPB reserve
Oath Farm	25 ha	(60 acres)
Horsey Farm (Muchelney)	37 ha	(91 acres) privately funded
Town Tree Lane	33 ha	(81 acres) privately funded
North Moor Corner	38 ha	(95 acres)
King's Sedge Moor	162 ha	(400 acres)

Information correct to January 1997.

Issue 23 - The need for more RWLAs.

Options for Action

We will actively seek to participate in the restoration of wetlands in the catchment through the implementation of the Somerset Levels and Moors Water Level Management and Nature Conservation Strategy, by engineering RWLAs and through the WLMP process.

We will continue to support monitoring to assess the effects of RWLAs on overall bird numbers and on grassland composition.

7.3.2 Biodiversity

Biodiversity within the Parrett Catchment is in decline. Much of the wildlife interest is now confined to SSSIs, particularly in the Levels and Moors, where there has been a dramatic decline in the numbers of breeding waders and wintering wildfowl. These losses are attributed by many to the drying out of the Moors as a result of the continued maintenance of low water tables, which has also resulted in a rapid loss of botanical interest and damage to sites of archaeological value.

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. See Issue 24, ***Options for Action***.

Target - To prevent further decline in biodiversity and assist in restoration work

State of the Environment

Some restoration work has been carried out in partnership with others but more remains to be done.

We have undertaken a baseline study of water quality within the rhyne and ditch systems of the main wetland areas containing SSSIs, in an attempt to reveal any trends such as increased eutrophication. There is concern that a build-up of nitrate and phosphorus, both in the water column and sediments, may be causing detrimental changes to the plant and animal communities by leading to algal blooms and overwhelming growth of duckweed (*Lemna sp*). The study is aimed at investigating the causes of this perceived decline. Specific problems notified to us include discharges from septic tanks at Moorland into the ditches which feed North Moor SSSI. (See Issue 1 and Issue 24, ***Options for Action***).

Target - To assist in the development and implementation of species and habitat action plans for rivers and wetlands in the catchment

State of the Environment

A biodiversity audit has not yet been carried out at the catchment level, nor have specific biodiversity targets been set. The Wessex Otter Conservation Project of 1992 established the fact that Somerset remains an important stronghold for the otter in South West England. The potential for expansion of the population within and out of the catchment is relatively high, although no specific work has been undertaken to determine limiting factors. We have embarked on a study to establish population trends and pesticide levels in eels, (the main food of otters) which may reveal certain factors in the decline of otters. The wetland rehabilitation work which is currently under way through the ESA, our Somerset Levels and Moors Water Level Management and Nature Conservation Strategy and the work of organizations here and in other parts of Somerset should benefit and provide more suitable habitat for this species. Investigative work into the causes of otter deaths will continue.

Issue 24 - The decline in biodiversity.

There is a need to reverse the decline in biodiversity throughout the catchment. In particular there is a need to reverse the decline in botanical interest and improve populations of breeding waders and over-wintering birds on the Levels and Moors within the catchment.

Options for Action

We will work with other organisations such as local authorities, EN, RSPB and Somerset Wildlife Trust (SWT) to establish and implement biodiversity targets for the catchment. EN is currently producing a Natural Resources Audit to assist with the WLMP process for wetland SSSIs. We are supporting this work, which will provide a framework for the balanced management of wetlands within the Catchment.

Local biodiversity targets and action plans are needed for species (such as otters, water-voles, and brook lampreys) and habitats, including watercourses and floodplain grazing marshes. The implementation and monitoring of Habitat and Species Action Plans will be a collaborative venture between several different participating organisations, including MAFF, and will depend upon resources being available.

The Government is committed to maintaining and extending biodiversity in the UK. We have accepted that we will be the lead agency in implementing and monitoring 12 species action plans. We have also agreed to play a part in developing the Biodiversity Action Plan for the South West Region.

We will work with local authorities/Highways Agency to ensure that underpasses are installed as appropriate to prevent otter deaths on the roads e.g. Ilminster bypass.

We will seek to persuade MAFF to designate the Levels and Moors as a no-go area for signal crayfish, as the presence of this predatory species would have a detrimental effect on the flora and fauna of rhyne and ditch systems.

We need to know more about eel and elver populations and their life cycle to ensure that the elver fishery is sustainable. A project is about to start which will look at barriers to migration.

We will also try to conserve biodiversity by controlling invasive plant species in the catchment. Our policy regarding Japanese Knotweed, Giant Hogweed and Himalayan balsam is to take steps to control these plants where other Agency work is taking place, and to advise landowners on methods of control. Insufficient information is known about Himalayan balsam within the catchment to assess the nature and extent of the problem. However, it should be possible to eradicate it from the River Isle providing action is taken now.

Target - To conserve springline mires and headwater stream habitats

Given the artificiality of much of the middle and lower reaches of the catchment, it must be a priority to protect the geomorphological variability of the headwater streams, which are

also vitally important nursery streams for fish and refuges for water-vole, water shrew, otters and specialised invertebrates which thrive in these conditions.

State of the Environment

The springlines rising in the Blackdown Hills ESA produce ecologically important flushed areas where acid/alkali conditions in close proximity produce interesting bog and fen communities. Little is known about the biological value of many headwater streams. Headwaters are vulnerable to low flows and sensitive to relatively low polluting loads. The headwaters of the Ding, Isle and Fivehead River, important trout nursery streams, suffer from drying out in many summers.

Issue 25 - The need to conserve springline mires and headwater stream habitats.

Options for Action

Springline mires are an important feature of the catchment which we will seek to protect through our regulatory activities.

We will study the findings of the NRA's Headwater Streams R&D project, and implement within the catchment. This will involve our water quality, water resources staff and biologists in undertaking surveys and implementing conservation strategies. We will seek to persuade MAFF that headwater streams should be a priority target for Stewardship grants. We will promote buffer strips in these locations.

7.3.3 Priority Management

Target - Flood Defence Management System implementation

To manage flood defence by examining shortcomings through the Flood Defence Management System by 1997 and setting priorities for action.

State of the Environment

The management framework has been agreed, and the techniques are being piloted.

Issue 26 - The need for a Flood Defence Management System.

A fully integrated Flood Defence Management Manual and supporting system are required to improve targeting of resources to the greatest needs.

Options for Action

Introduce a Flood Defence Management System into the Region during 1997. Data collection on Assets and Flood Risk Areas are programmed for 1997. Calibrate and develop further an existing model of the Tone and Parrett system to identify future requirements.

Target - To identify and investigate all flood risk locations

State of the Environment

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 12: Flood Defence - Indicative Standards

Current Land Use	Land Use Band	Sea (Return Period - years)	River (Return Period - years)
High density urban, containing significant residential and non-residential property.	A	100-200	50-100
Medium density housing.	B	50-200	25-100
Low density or rural communities. Highly productive agricultural land.	C	10-100	5-50
Generally arable farming with isolated properties.	D	2.5-20	1.25-10
Low productivity land with few properties at risk.	E	<5	<2.5

Note: indicative standards are only a guide: they may not always be appropriate.

We maintain a register of flood problems and we are developing a Long Term Plan of Needs.

Issue 27 - Identification of flood problems.

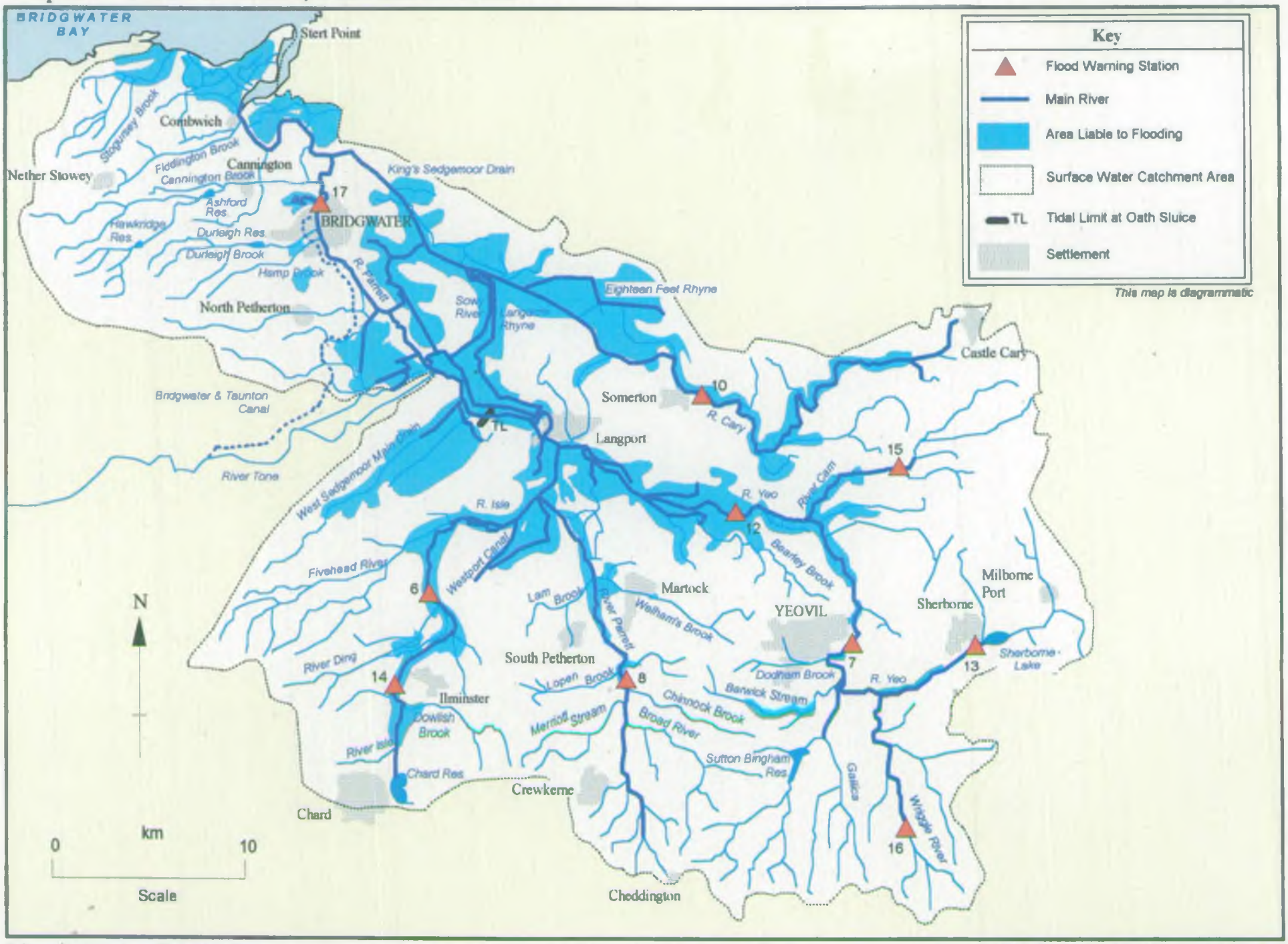
The need to identify flood problem locations within the catchment.

Options for Action

Continue the programme to review flood problems. The introduction of the Flood Defence Management Framework identifies the relative priority of schemes to alleviate flooding problems.

Target - To provide properly appraised flood defence schemes

Map 28 - Flood Defence, Floodable Areas



Information correct as of December 1996

State of the Environment

We undertake a programme of capital works as per our Medium Term Plan which is derived from the Long Term Plan of Needs.

7.3.4 River Maintenance

We maintain rivers and flood defence structures to minimize the risk of flooding, and to maintain and enhance their fisheries and conservation value.

Target - Consistent Flood Defence maintenance

To apply a consistent approach to flood defence maintenance, with work targeted at areas of greatest need, and adopt best working practice techniques for our routine maintenance.

State of the Environment

We try to focus our work where it is needed most. We work out how best to concentrate our efforts using the Flood Defence Management System (FDMS). We have only just started to use this technique and are collecting the information we need to make it work. On the Somerset Levels and Moors this involves prioritizing maintenance needs by considering the extent of flood damage and its risk of occurring if maintenance is not undertaken. Upstream from the low embanked reaches a simplified method of Standards of Service (SoS) can be applied within the FDMS. The SoS methodology is being introduced for upland rivers, and the benefits of maintenance are being analyzed for the Levels and Moors. This work links to the review of flood defence practices as part of the Somerset Levels and Moors Water Level Management and Nature Conservation Strategy.

Issue 28 - The need for improved efficiency and effectiveness in maintenance work.

There is a need to improve the efficiency and effectiveness of our flood defence work.

Options for Action

Asset surveys are due to be completed in 1998/99. Upland river reaches will be classified in accordance with the SoS methodology during 1997. The Levels and Moors analysis will be completed by 1998.

Target standards will be compared to the current state and requirements for changes negotiated with interested bodies from 1998.

7.3.5 Privately Owned Sluices and Hatches

The middle reaches of many rivers in the catchment have been impounded to power mills, and the height of many of the weirs and sluices was elevated in Victorian times, thus worsening the effects. Many of the sluices and hatches are no longer operated and

responsibility for this lies with the landowners. Fish are often lost through the inexpert operation of sluices. We will seek to provide guidance to landowners on the operation of their structures to benefit the water environment.

7.3.6 River Restoration

Rivers can benefit from improvements to the river corridor which would increase their ecological value and improve water quality. Works could be undertaken through capital schemes or during flood defence maintenance works, and could include:

- changes to existing maintenance regime,
- sympathetic ditch maintenance (in conjunction with IDBs),
- creation or rehabilitation of marshland habitat,
- tree and shrub planting or maintenance (e.g. pollarding and coppicing),
- moving existing fencelines back from the rivers edge,
- pulling back flood banks where river channel morphology and wildlife is compromised,
- creation of berms, bays and bankside reedbeds,
- replacement of in-channel features such as cattle drinking points and bays, pools and riffles,
- creation of buffer strips, particularly in arable areas.

Particular maintenance practices to be reviewed are weedcutting, desilting and bank flailing on the lower reaches of the Isle, Yeo, Cary and non-tidal Parrett, and the non-routine maintenance regime for the King's Sedgemoor Drain, which results in extensive dredging at fairly lengthy intervals. Relaxation of intensive maintenance regimes, where not justified in the interests of flood defence, will reduce operational costs and have significant fisheries, wildlife and landscape benefits.

We will also continue to support initiatives such as the MAFF Countryside Stewardship Waterside Landscape grants and will work with organizations such as MAFF to promote the establishment of riverside buffer strips.

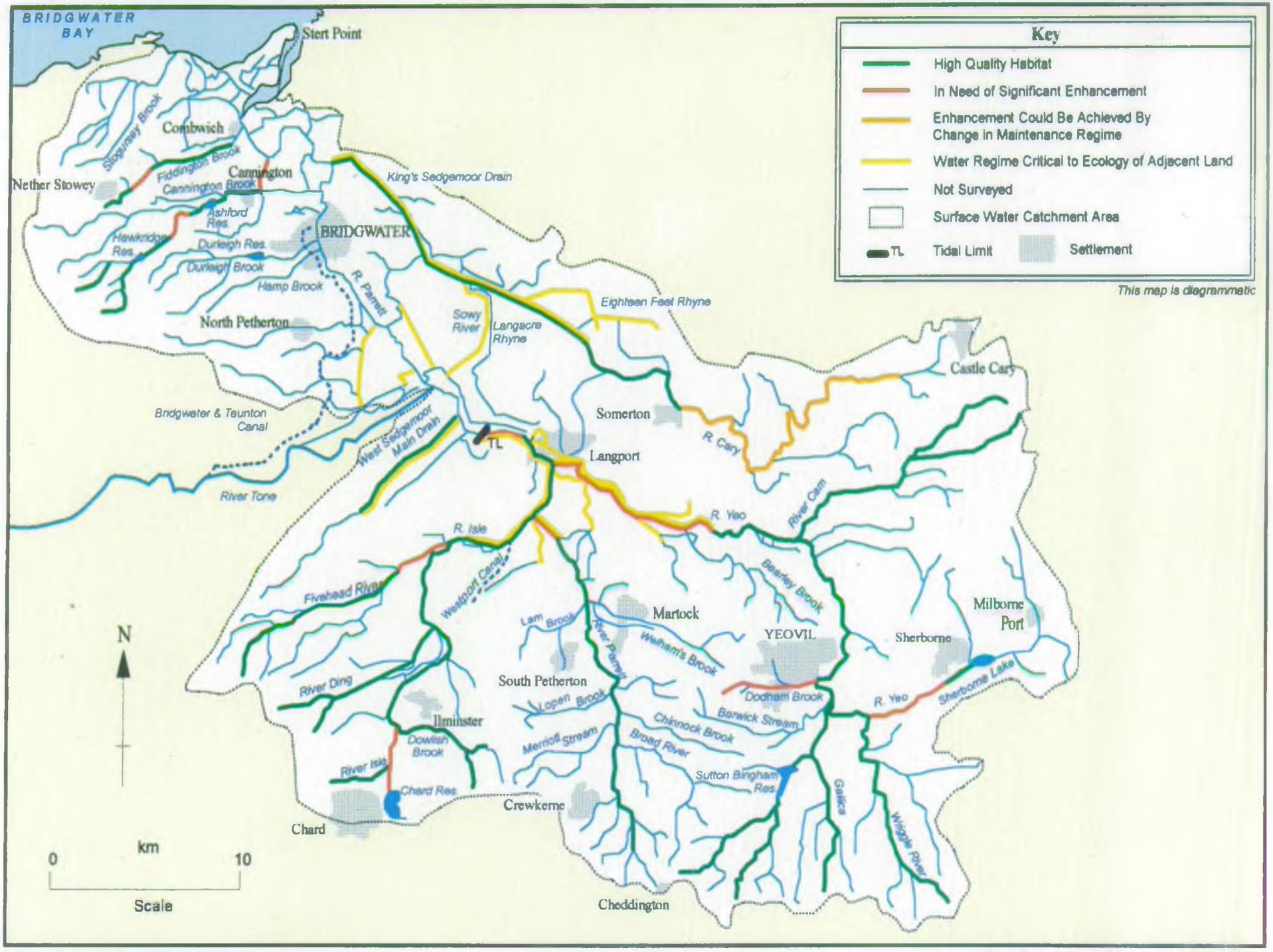
Target - To develop restoration schemes on degraded river reaches

We will aim to develop restoration schemes on degraded river reaches, where significant habitat rehabilitation is required to improve the ecological interest. See Map 29 - State of the Environment - River Corridor Habitat.

State of the Environment

There are numerous locations where rivers could be rehabilitated, see Map 29 - State of the Environment River Corridor Habitat particularly on the Cary and Yeo, principally those sections engineered for the defence of agricultural land from flooding where the existing channel shape limits the opportunities for wetland wildlife. An improvement to river structure would benefit flood defence, fisheries and wildlife.

Map 29 - State of the Environment - River Corridor Habitat



Information correct as of December 1996

Issue 29 - The need for channel restoration in degraded stretches.

Options for Action

We will continue to promote river restoration schemes in the catchment. We will aim to continue river corridor and river habitat surveys (RCS and RHS) to enable us to identify those watercourses failing to meet their ecological potential based on physical structure and set priorities for action.

The opportunities in this catchment hinge on the potential for fluvial set back, where one flood bank is pulled back to form a two stage channel which can be less intensively maintained. Reedbed, rough grassland and scrub habitats would develop within the river corridor, providing far greater opportunities for wetland wildlife and hunting grounds for birds of prey, whilst improving landscape and amenity value at the same time. Tree planting may also be appropriate in some locations to produce shade and reduce weed growth and therefore maintenance problems.

We are developing a National Policy on trees and floodbanks. Current practice on the lowland embanked watercourses is to regularly flail the banks and remove aquatic plant growth from the channel, thus preventing trees and shrubs from becoming established naturally. There is some concern that root systems will threaten the integrity of floodbanks and encourage colonisation by badgers and rabbits. However, these disadvantages have to be weighed against the advantages which could accrue from the provision of scattered shade to reduce in-channel plant growth and from the benefits of tree and shrub cover to landscape and wildlife. However, this will not be appropriate in open moorland landscapes.

7.3.7 Parrett Relief Channel Operation

Target - To operate the Parrett Relief Channel in the most cost-effective manner with agreement of all interested parties.

State of the Environment

The Parrett Relief Channel, or Sowy River, was completed in 1972 to provide an alternative outfall to sea via the King's Sedgemoor Drain when levels were high in the lower reaches of the River Parrett. The King's Sedgemoor Drain's capacity was increased to accommodate the extra flood flow. Since completion, Internal Drainage Boards (IDBs) affected have consistently insisted that the system passes more than the design flow to the King's Sedgemoor Drain. Significant beneficiaries of the works are landowners on Aller Moor, and this has led to strained relations with other IDBs.

The existing ONDA model has not been calibrated due to the lack of flow gauging locations on the Levels and Moors.

Issue 30 - The need for efficient Parrett Relief Channel operation.

There is a need to identify the operating parameters of the Parrett Relief Channel, and operate it fairly and in the most cost effective manner.

Options for Action

We will develop our existing ONDA model of the Parrett and its relief channel by calibrating it from flow records from newly introduced gauges during the winter of 1996/97, and then use the model for several different operational options. Results will be presented to the IDBs affected for agreement on future operation.

7.3.8 De-silting

Target - To identify a justifiable frequency for de-silting the Parrett below Burrowbridge

State of the Environment

Due to the silt load in the Parrett, the tidal length below Burrowbridge finds its own optimum size, depositing silt on the turn of the tide, and flushing it out again during high fluvial flow. Thus the upstream section of the river narrows.

The full ecological value of this sub-estuary has not been properly evaluated, but the section is vitally important as an inland route for elvers, is regularly used by otters, and includes the only known locations of the rare hairy click beetle in Somerset.

Because the amount of fluvial flow downstream during a flood is restricted by tidal levels, the channel section size has a small effect on levels. Initial runs of the Parrett computer model suggest this channel size effect is significant over the first 2 km reach downstream from Burrowbridge, but the scale of this effect cannot yet be predicted.

By the winter of 1993/94, this reach of the Parrett had narrowed its section with silt that was not getting flushed by high flows. Many perceived this to be a major influence on the floods of that and the next winter.

In the summer of 1995, the NRA de-silted the first 500 metres below Burrowbridge, and we have now de-silted a further 1.2 km downstream in 1996.

Issue 31 - The need to establish a justifiable de-silting frequency below Burrowbridge.

The significance of de-silting the Parrett below Burrowbridge needs to be investigated in order to set a reasonable frequency for this expensive operation. Any such work would require an environmental appraisal and must take account of the presence of archaeological features, rare species and any opportunities for enhancement.

Options for Action

We will develop our existing ONDA model of the Parrett and Tone by calibrating it from flow records from gauges newly introduced during 1997, and then use the model to investigate the significance of the section area of the reach below Burrowbridge on levels on the Tone and Parrett for various events.

7.3.9 A Parrett Barrage

Target - To provide to those interested, the results of the NRA's investigations into a Parrett Barrage, and to publicise the reasons for the Environment Agency not promoting the project further

State of the Environment

In the 1970s, the NRA's predecessors carried out an in-depth study of the options for providing significant reductions in flood risk on the Somerset Levels and Moors. The most favourable of these options included the construction of a tidal barrage on the Parrett, and three more locations downstream from Bridgwater were considered. None of these barrages by themselves provided sufficient flood relief, but by expelling tidal fluctuation, and most importantly silt from the current tidal lengths of the Parrett and Tone, they allowed for extensive channel improvements.

The most favourable option updated to a present cost of £55 million, including the channel works (the Barrage itself cost £25 million) with a benefit of £11 million. The benefits included reduction in damage to Bridgwater, which has since been protected by a scheme of its own. The costs did not include dealing with the excessive build up of silt at the Barrage and in the navigable channel downstream, nor the improvements necessary to deal with the significant reduction in water quality upstream from the Barrage resulting from the loss of tidal flushing.

The 1970s study did not begin to deal with the environmental concerns that would be raised not only in conjunction with the barrage structure, but also with the significant channel works which would be needed and which would affect sites of national importance. Bridgwater Bay and most of the wetland SSSIs within the Parrett Catchment are also proposed SPAs and therefore judged to be of international importance.

Recently in response to the 1994/95 flooding, the Somerset branch of the Association of Drainage Authorities has been trying to involve the NRA and now the Environment Agency, in reviving the Barrage proposals. The Agency does not believe any future work is justified on flood defence grounds.

Issue 32 - River Parrett Tidal Barrage.

Many landowners affected by flooding on the Somerset Levels and Moors perceive the construction of a tidal barrage on the River Parrett as being the means to alleviate flood risk to a more acceptable level.

Options for Action

We will continue to provide to anybody interested in promoting a Parrett Barrage results of the extensive studies into options in the 1970s and its 1995 update of costs and benefits. Due to the significant shortfall between costs and benefits to flooding, we will not expend our own resources on a new investigation.

7.3.10 Pumping

Target - Tariff and operations reviews

To review annually tariffs for electricity supply to Langport pumping stations, and to investigate operations that will allow earlier running during inundation of their Moors.

State of the Environment

Midelney, Westover and Huish Episcopi pumping stations above Langport were modernised to more efficient and flexible electric motors between 1963 and 1965. They were designed to work on off-peak by upgrading the capacity of the pump motors by 24 to 17½, the ratio of the number of hours the old diesel motors had been available to the off-peak hours availability.

This does lead to some operational problems, especially when the pumps are unavailable to maintain a summer pen level.

During times of flood, Westover pumping station reduces levels threatening flooding of property at Westover Trading estate. Huish Episcopi pumping station reduces levels threatening to flood roads and cut off the village of Muchelney. SWEB have accepted that when this happens, and we inform them of such an emergency, they will arrange a temporary transfer to a much higher tariff allowing twenty-four hour pumping. For the rest of the time, the tariffs negotiated for off-peak use are so favourable that a change to a new tariff cannot be justified.

During the winter of 1994/95, the Langport pumps were switched on to demonstrate the effect they have downstream. Within an hour, the Hook Bridge Spillway on the River Tone began flooding Curry Moor because of the increased water in the River Parrett, and the pumps were switched off again. Because of the effect they can have downstream, Langport pumps are left switched off even when their Moors are badly flooded, until downstream levels can accept the increase. Also during the winter of 1994/95, with much lower flows in the King's Sedgemoor Drain, and agreement of the respective IDBs, the culvert throttle on the Sowy was physically removed. This allowed more water down the relief channel, and meant the Langport pumps could be switched on earlier. The computer model of the Sowy needs calibrating for use in investigating such operations to find the most cost effective method of operating in all events in the future.

Issue 33 - Pumping station operation.

The operation of the pumping stations above Langport, i.e. Midelney, Westover, Huish Episcopi and Long Load, operate on off-peak electricity, and often stand idle whilst their Moors are flooded.

Options for Action

Annually we will review the tariffs available from all possible electricity suppliers to try to find an acceptable price for twenty-four hour operation. Until such time, we will continue

to operate on off-peak. We will also develop our existing ONDA model of the Parrett and Tone to try to find an operation acceptable to all parties which allows earlier running of the Langport pumping stations without exacerbating levels downstream. Changes to pumping regimes will need to be appraised for any potential environmental impact.

Target - Pumping plant maintenance

To introduce a programme of planned maintenance and capital refurbishment for the catchment's pumping plant.

State of the Environment

Appendix 4 reviews the condition of the individual pumping stations in the Parrett, Isle and Yeo catchment. The budget needed to meet the recommendations for replacement and refurbishment is not currently available, and therefore plant can only deteriorate and be dealt with on a breakdown basis.

Issue 34 - The need for planned pumping plant maintenance.

Pumping plant in the catchment is subject to risk of failure due to past practice of maintenance on a breakdown basis. There is a need for a programme of planned maintenance.

Options for Action

We will suggest a programme of planned maintenance and capital refurbishment which will increase the design life of the pumping plant, and reduce the risk of serious failure. This can only be implemented by switching extra expenditure to this asset maintenance. This programme will emerge from the strategic review of our role in operating the land drainage system of the Somerset Levels and Moors.

7.3.11 Floodbanks

Target - To identify formal spillways

To identify and make public the mode and locations of flood flow overtopping where it is not justified to raise levels and cause the overtopping to occur elsewhere. (NB This issue links to the proposed review of operations under the Somerset Levels and Moors Strategy see Appendix 3).

State of the Environment

Unlike the Parrett and Tone downstream from Langport, the Parrett and its tributaries upstream do not have formalised spillways to allow channels to overspill into adjacent Moors in flood conditions. In the locations where overspill occurs upstream from Langport, some landowners see the low spots as a failure of the NRA in the past, and now the Environment Agency to raise the bank.

Issue 35 - Floodbank overtopping.

We need to identify these locations, consider if they are the lengths causing least damage, and either raise them, or declare them spillways. Any proposals likely to change the flooding/flow regime of moorland SSSIs would need to be accompanied by an assessment of likely environmental impact.

Options for Action

We will survey the floodbank levels of the Parrett, Isle and Yeo above Langport, and will review the mode and locations of overtopping from the rivers to the Moors and assess the environmental implications.

Target - Parrett bank maintenance review

To produce a programme of work for maintaining the integrity of the Parrett banks based on a strategic review.

State of the Environment

Due to the soft land the Parrett floodbanks are founded on, they will settle over time. In times of long duration flooding, the banks can remain saturated for weeks, and during the flooding of 1994/95, several lengths required emergency piling. Capital Works are identified for strengthening further lengths, for which the Ministry of Agriculture, Fisheries and Food (MAFF) requires a strategic review before grant-aiding any more work.

Issue 36 - The need for a strategic review of bank maintenance.

For 15 years the banks of the tidal length of the Parrett have been strengthened, a length at a time, by Capital Works. There is a need for a priority based approach to this work, justified by a strategic review.

Options for Action

We will engage consultants to carry out a strategic review of the River Parrett banks, their condition, and the need for future strengthening work. This review will take into account environmental concerns and opportunities for enhancements.

7.3.12 Recreational use of Agency Owned Land

Target - To provide for greater recreational use of Agency owned land

State of the Environment

We own substantial tracts of land within the catchment, notably the Westport Canal, West Sedgemoor main drain, Sowy Flood Relief Channel, Cripps River and King's Sedgemoor Drain. Public access to this land is possible using footpaths and car parks constructed primarily for use by fishing associations.

Issue 37 - The need to provide for recreational use of Agency owned land.

There is potential for encouraging greater recreational use of the land by installing more user-friendly access points (to give access to people with pushchairs or bicycles for example), by producing interpretive literature, by allowing use by groups such as scouts and guides, and by providing facilities to enable canoeing where appropriate. Given the low population density in the area, and providing access is concentrated on one bank only, such an increase in use is unlikely to have an adverse impact on wildlife if properly planned and resourced.

Options for Action

We are committed to producing Conservation and Recreation Management plans for land in our ownership to address multiple use issues. We intend to produce one plan each year.

7.3.13 Regulation

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. In our day to day regulatory activities we follow principles which constantly seek to safeguard the intrinsic natural qualities of watercourses, maintaining and enhancing the total river environment where possible.

7.3.14 Urban Development

In accordance with DoE Circular 30/92 'Development and Flood Risk', we recommend a minimum level of flood protection for urban development against a 1 in 100 year flood event. It is, of course, the responsibility of the Local Planning Authority (LPA) to set higher standards of flood defence protection if they so wish.

These areas of existing urban development which are not protected to the current standard are identified and reviewed in the Agency Capital Works Programme. Where the Benefit/Cost analysis is favourable the Agency will endeavour to provide flood defences. Where the analysis cannot justify the provision of new flood defences the Agency will provide a flood warning service to the householders affected by flood risk.

We are proposing to undertake a full catchment drainage model study of the Isle, Yeo and Parrett Catchment from the tidal limit at Oath Sluice. The model will be available to determine the effects of urban development on the catchment, and to develop appropriate drainage policies for surface water disposal. If the budget allows, the study will be undertaken during 1996/97.

7.3.15 Wetland Archaeology

Target - To conserve wetland archaeology

State of the Environment

The wetland archaeology of the Parrett Catchment exists as organic remains preserved within the waterlogged peat soils, and includes some of the most important finds in Western Europe. This unique archaeological record is extremely vulnerable to damage through land drainage and subsequent cultivation activities. See Section 6.1 Archaeology.

Issue 38 - The need to conserve wetland archaeology

Options for Action

We will work with local authority archaeologists and other organizations to ensure that our maintenance work and capital schemes do not cause damage to sites and artefacts. The promotion of RWLAs through the ESA and WLMPs should also help to ensure the long term preservation of this important part of our natural heritage.

7.3.16 River Valley Landscapes

River valleys and wetlands are important parts of the valued landscapes of the catchment. We have a standard survey method which we use to highlight areas which need to be protected or enhanced. We ask planning authorities to use their powers to protect river valley landscapes as they plan and control development.

Target - To protect threatened or special river valley landscapes

State of the Environment

A number of designations provide some measure of protection to landscape features, but the landscape of the river valleys has not been directly evaluated using standard methodology.

Issue 39 - The need for more information and data on river valley landscapes.

We have not studied river landscapes in sufficient detail to understand how best to protect or enhance the river valley landscapes in this catchment.

Options for Action

We will work with organisations such as local authorities, the Countryside Commission and MAFF to protect the varied landscapes in the Parrett Catchment from the adverse effects of development. We will also consider the potential effects of our operations (such as river maintenance) on the landscape, and seek to restore degraded areas as and when resources become available. Although many land use decisions are beyond our control, by promoting strategic landscape assessment we hope to inform planning and development control decisions and thereby to protect valued river landscape features.

7.3.17 River Corridor Visual Amenity

Target - To agree a partnership approach to bank maintenance and river corridor litter

State of the Environment

The public have expressed concern to local authorities at the amount of debris in rivers and on the banks particularly in town centres and most particularly in Bridgwater. This includes old bicycles and supermarket trolleys. Concern has also been expressed regarding the infrequency of the trimming of vegetation along the banks, particularly in Bridgwater.

Issue 40 - The need for a forum to develop a strategy to improve the visual amenity of river channels.

Litter, debris and untidy plant growth all can detract from the visual amenity of river channels especially in town centres such as Bridgwater.

The Environment Agency has no duty to remove litter and therefore is not resourced to do so. The Agency will, however, remove debris from a watercourse if it is causing an obstruction to flood flow. Unfortunately, a shopping trolley in the Parrett at Bridgwater is not such an obstruction.

Options for Action

There is a need for a forum of interested parties to meet to develop a strategy. The could best be chaired by the local authority and the Environment Agency would be a member.

7.3.18 Emergency Response

Target - Where possible, to issue a warning at least two hours in advance of flooding

State of the Environment

The location of floodable areas and Flood Warning Stations is shown on Map 28 - Flood Defence - Floodable Areas. Details of the 4 current flood warning services in the Parrett Catchment can be found in the Somerset Flood Warning Dissemination Plan which is held in North Wessex Area office and at Exeter and is available for public inspection.

Issue 41 - The need to issue flood warnings at least 2 hours in advance of flooding.

Options for Action

Absolute flood protection is not possible. Because of this we need to warn people when there is a danger of flooding. A study of Flood Warning Levels of Service, is investigating how the current flood warning procedures operate and will be used to improve our emergency response. Major Incident Plans will be developed for large urban areas at flood risk, in association with local authorities, over the next two years.

7.4 WASTE

Target - Draw up a regional strategy for the management of waste

State of the Environment

Planning for the management of waste is an activity best undertaken looking at a large geographical area, as well as the need of particular locations. For this reason there is a need to look at demand and supply beyond the boundary of this catchment. Key waste management decisions are required before the end of 1997/98 due to capacity running out at current facilities and the length of time required to plan, approve and start up new facilities.

Planning for waste management cascades from National to Regional to County to District level. This is undertaken by two distinct groups: first the Environment Agency who review current and future waste generation, and from this the size and types of management facilities which are required. Second the local authorities who are required to make provision for sufficient and adequate facilities within their Local Plans.

There is a need for the Environment Agency to develop a regional strategy to identify the current and future extent of the types and quantities of waste and the management facilities needed. The first requirement is the collection of accurate statistics from the current waste management situation to provide an accurate base. This will be followed by the development of a strategy that will take account of the need to follow the policies of regional self-sufficiency for waste management and the use of the proximity principle when considering potential strategies.

Waste Disposal Authorities (WDAs) are required to make arrangements for the management of household waste for which they have a statutory duty. Waste management facilities are provided after competitive tendering. It is anticipated that a local strategy for waste management will be developed by WDAs in consultation both with the Environment Agency and the appropriate Waste Planning Authority. As these strategies will once again be required to seek regional self-sufficiency and follow the proximity principle, it is anticipated that local and regional waste management facilities will need to be identified.

The undertaking of a waste management survey and production of a regional strategy will take place outside the forum of Local Environment Agency Plans (LEAP) such as this. Reporting however can be made in the LEAP Annual Reviews, and once completed the strategy can inform the LEAP process.

Issue 42 - The need for a regional waste strategy.

Options for Action

We will make progress with a national waste survey to gather information on the types and quantities of waste arising now and in the future. This should be completed during 1998/99. An Interim Strategy may be developed during 1997/98.

Develop a regional waste strategy which would identify the requirements for waste disposal facilities.

The County Council Planning Authorities are drawing up Waste Local Plans to identify suitable locations for waste management facilities.

Target - Reduce waste production in line with government guidelines

State of the Environment

In December 1995 the DoE produced the strategy for sustainable waste management based on a hierarchy of waste reduction, reuse, recovery and, lastly, disposal. In it they have set two primary targets:

- to reduce the proportion of controlled waste going to landfill to 60% by 2005,
- to recover 40% of municipal waste by 2005.

They have also made a commitment to a third target; by the end of 1998, so set a target for overall waste reduction. These primary targets are supported by a number of more detailed targets. See Section 6.7 - The Management of Waste for details of local waste arisings.

Issue 43 - Need for reduction in waste production and the proportion going to landfill.

Options for Action

We will encourage waste minimisation initiatives and provide advice and guidance to the public and industry on sustainable waste management.

We will participate in waste reduction initiatives such as the Somerset Waste Minimisation Group.

County Councils and District Councils will develop schemes to recycle household and commercial waste.

Target - Prevent the operation of waste management facilities having an adverse environmental impact

State of the Environment

Landfill sites are now designed and engineered to be able to cope with the resulting pollutants. Systems and controls such as site licensing, inspections and monitoring by the Environment Agency are in place to minimise any risks. Stringent licensing conditions and regular site inspections control potential operational problems such as noise, dust, odour, litter and general unsightliness at facilities. The site operator is responsible for complying with the conditions of the licence even once the site is closed. The site licence can only be given up once the Agency is satisfied that no further risk to the environment exists, when a Certificate of Completion will be issued.

There has also been an increase in the range of waste management facilities exempted from waste management licensing. We will scrutinise all notifications received of exempted activities to ensure that they pose no risk to the environment or harm to human health.

Older closed landfill sites (except inert waste sites) where the licence has been surrendered are regarded as contaminated land - see Section 6.8 - Contaminated Land.

7.5 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.

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 from the DoE is available on freephone telephone number 0800 556677. Information is also available on the Internet at http://www.open.gov.uk/doe/doehome.htm. and on Ceefax pages 404, 410-414, Teletext page 106.

Local authorities carry out ambient air quality monitoring in the catchment area, generally by the use of 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 and this also supplies national network data for this pollutant.

The Environment Agency has published 'The Environment of England and Wales - a Snapshot' which describes the state of the environment, including air, in the UK.

7.5.1 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 1996. We will be working closely with local authorities to help achieve the objectives of the National Air Quality Strategy.

7.5.2 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. Local authorities are the lead authority in the regulation of air quality.

A pilot study (one of 14 in the UK) has been taking 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 and the region. We will contribute to achieving Local Air Quality Action Plan targets by means of our regulation of prescribed "Part A" processes which have emissions to air. See Section 6.14 Controlled Processes.

7.5.3 Ground Level Ozone

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

In common with other parts of Southern England, ozone levels in the catchment are generally above those at which damage to vegetation may occur. The Expert Panel of Air Quality Standards (EPAQS) recommend an Air Quality Standard (AQS) 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 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.

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*

7.5.4 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) such as solvents, and oxides of nitrogen (NOx), both of which are precursors in the formation of ground level ozone. VOC and NOx releases from IPC processes are controlled by limits in authorizations. These limits will be reduced over time as operators move towards new plant standards.

7.5.5 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 7.5ppb as an annual average. Human health effects are best gauged by reference to the recommended standard from EPAQS - 100ppb 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. A local example of this is the decision in 1996 by UCB Cellophane, Bridgwater to cease the use of Heavy Fuel Oil as their stand-by fuel for the IPC authorized combustion process, in favour of the much lower sulphur content gas oil. Data for the past ten years (April to March) measured in central Bridgwater are given below:

Table 13: 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.

7.5.6 Nitrogen Dioxide

Nitrogen dioxide (NO_2) 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 104ppb 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 40ppb 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/m^3 (15.7 ppb) for effects of nitrogen oxides (nitrogen dioxide (NO_2) and nitric oxide (NO) on vegetation.

It is anticipated that the exceedances of air pollutants recorded within the area will be reviewed as part of national and local initiatives previously described.

7.5.7 Acid Rain

The term 'Acid Rain' is loosely used to describe wet or dry deposition of acidic compounds from the atmosphere. It is popularly used to mean rain, mist or snow which contains acid compounds predominantly of sulphur and nitrogen. The main sources of these acid gases are power stations and other large industrial combustion plantS which burn fossil fuels (coal, oil and gas) and (particularly in the case of oxides of nitrogen) motor vehicles. Ammonia which arises from agriculture may under some soil conditions also lead to acidification. Natural sources of sulphur dioxide such as volcanoes and marine algae account for only a few percent (less than 5%) of the acid deposition received in the UK.

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 causes damage to plants and soils in which they grow. In these areas substances can be released from soils which run-off into water bodies and are toxic to water life. Acid deposition can also alter the acid balance in water bodies and this too has an effect on the life they support; it can also corrode buildings. 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. The planting of coniferous forest can make acid conditions in watercourses worse.

In recent years there has been increasing interest in the development of effects based emission control policies and this has led to the development of the critical loads approach as a science-based way of optimising air pollutant emission control strategies. The concept of a critical load is a simple one - it is the threshold at which the pollutant load causes harm to the environment and has been defined by the United Nations Economic Commission for Europe as:

* a quantitative estimate of exposure to one or more pollutants below which significant harmful effects on sensitive elements of the environment do not occur according to present knowledge.

In the case of soils the critical load has been calculated on the basis of the rate of production of acid neutralising compounds as part of natural weathering. Different soils will weather at different rates and hence will be more or less sensitive to acid deposition. Rocks such as granite are relatively slow to weather and therefore are sensitive to acid deposition. There are no acid sensitive areas within the catchment but we will assess data to check for any emerging problems.

There are no breaches of air quality standards known to be caused by authorized IPC processes in the catchment. However, local issues which have caused public comment or complaint are noted in Table 1, below.

Table 14: IPC Authorized Sites

Operator	Issues/Notes
UCB Cellophane Ltd, Bridgwater	Characteristic unpleasant odour associated with the viscose process. Has been minimised by the passing of "foul air" to the site combustion process, where a high degree of destruction is achieved. Improvement programme requires investigation of further reductions in emissions.
Crosby Ltd, Bridgwater	Local problems of dust and odour associated with wood-waste fired boilers. Improvement programme requires upgrade to BATNEEC for this process.

7.6 DEVELOPMENT PRESSURE

Target - to ensure that new development in the catchment has a minimal environmental impact.

State of the Environment

It is estimated that the catchment population will rise from 196,000 (1991 Census) to approximately 218,000 by 2001.

The associated housing, industry and infrastructure development will undoubtedly have some impact on the environment.

There will be a greater demand for public water supply. We expect the water supply companies to manage their existing resources effectively and to implement water demand management practices to make best use of water. This will include leakage control and domestic metering where appropriate. Providing these expectations are realized and WWSL can continue to transfer resources from areas of existing surplus then the increase in demand from such development can be met without the need for any major new resource development in the Structure Plan period up to 2011.

There will be an increase in sewage load but we will protect river quality by enforcing existing consents. WWSL can make charges on new developers and use the money to expand STWs and improve treatment standards.

The new development will give rise to an increase in household waste. At present each household produces 1.15 tonnes of waste per year. However, household waste is only 5% of the total waste stream. Predictions of increased waste will be influenced by developing concerns over current waste management practices and moves towards reducing waste at source and choosing more sustainable methods such as re-use, recycling and composting. The new Packaging Producer Responsibility Regulations will have an impact on waste production.

Expansion of industry can lead to an increase in polluting discharges to water and air.

Associated infrastructure such as new roads have an impact particularly on the water environment.

A major challenge posed by such development is to maintain the biodiversity and wildlife interest of the catchment.

Issue 44 - The impact of new development on the environment.

Options for Action

Work in partnership with local authorities to improve environmental protection policies and work towards a more sustainable development.

Work with WWSL to ensure that future needs for water supply and disposal can be sustained without unacceptable impact on the environment.

Advise the local waste disposal authorities and the waste industry on best practice for waste management.

Survey waste arisings in the Plan area.

Seek the earliest possible discussions with the local planning authorities and new road developers to advise on the best environmental option for the scheme.

APPENDIX 1

PUBLICATIONS

1 Somerset Levels and Moors Water Level Management and Nature Conservation Strategy.

2 Wildlife and Countryside Act 1981, HMSO, ISBN 0-10546 981-5.

3 Land Drainage Act, HMSO, ISBN 0-10-545 991-7.

4 Water Resources Act 1991, HMSO, ISBN 0-10-5457 91-4.

5 Salmon Act 1986, HMSO, ISBN 0-1-546286 1.

6 Salmon and Freshwater Fisheries Act 1975, HMSO, ISBN 0-10-545175-4.

7 Diseases of Fish Act 1937, HMSO.

8 European Council Directive on the Quality of Freshwaters Needing Protection or Improvement in order to support Fish Life (78/659/EEC). Official Journal of the European Communities No. L222.

9 Taunton Deane District Local Plan, Taunton Deane Borough Council.

10 DoE Circular 30/92, Development and Flood Risk.

11 Guidance Notes for Local Planning Authorities on the Methods of Protecting the Water Environment Through Development Plans, NRA, January 1994.

12 South West Regional Planning Guidance, HMSO, July 1994.

13 Somerset Structure Plan Review, Somerset County Council.

14 West Somerset - Dulverton Area Local Plan (West Somerset Parishes) 1984.

15 Bridgwater Area Local Plan 1990.

16 Devon County Structure Plan 1984, Devon County Council.

17 Mid Devon Local Plan (Deposit Draft 1995).

18 Taunton Deane Local Plan Issues and Options Report February 1995, Taunton Deane Borough Council.

19 West Somerset District Council District Wide Local Plan Consultation Report 1995, West Somerset District Council.

20 Position Statement on Landfill and the Water Environment, NRA, HO-1/95-5k-B-AMRS.

21 Draft for consultation of the Waste Local Plan Somerset County Council, January 1996, Somerset County Council.

22 Taunton Deane Nature Conservation Strategy Document.

23 Waste Regulation Authority Waste Management Plan Draft, September/October 1995, Somerset County Council.

24 Forestry Commission: Forest and Water Guidelines, 2nd Edition, 1991, ISBN 0-11-71029-2.

25 National Water Resources Strategy 1993, ISBN 87316048. Water, Nature's Precious Resource, NRA, March 1994, ISBN 011 88 65234.

26 Strategic Business Plan (Asset Management Plan 2), Wessex Water plc.

27 European Council Dangerous Substances Directive 'On Pollution Caused By Certain Substances Discharged In The Aquatic Environment Of The Community' (76/464/EEC).

28 European Council Directive on the Conservation of Wild Birds (79/409/EEC).

29 Policy and Practice for the Protection of Groundwater, NRA, 1992, ISBN 0-11-885822-X.

30 Tomorrow's Water, Water Resources Development Strategy, NRA South Western Region, April 1995. SW-4/95-K-B-ANOQ.

31 European Council Directive on Species and Habitats (92/43/EEC). Official Journal of the European Communities No. L206.

32 Code of Good Agricultural Practice for the Protection of Water, MAFF, 1991.

33 European Council Directive Concerning Urban Wastewater Treatment (91/271/EEC).

34 European Council Directive Concerning The Quality Required Of Surface Water Intended For The Abstraction Of Drinking Water In The Member States (75/440/EEC).

35 3rd North Sea Conference - Priority Hazardous Substances (Annex 1A List Of Substances).

36 European Council Directive 'Concerning The Protection Of Waters Against Pollution Caused By Nitrates From Agricultural Sources' (91/676/EEC).

37 River Plants, Haslam 1978, ISBN 0 521-21493.

38 Guidance for the Control of Invasive Plants near Watercourses, Japanese Knotweed, Giant Hogweed and Himalayan Balsam. HO-9/94-20k-C-AKVI.

39 Contaminated Land and the Water Environment Report - NRA National Water Quality Series No. 15, 1994, ISBNO-11-8865218.

40 The Environment of England and Wales - A Snapshot. Environment Agency 1996 ISBN

41 European Council Directive on Air Quality Standards for Nitrogen Dioxide (85/203EEC) OJEC.

42 "Air Quality A to Z", June 1995, Meteorological Office and Air Quality Division, DoE ISBN 0 86180..

GLOSSARY

ADAS	Part of MAFF (see below)
Algae	A diverse group of simple aquatic plants, some microscopic, which can grow in rivers and the sea in great profusion (blooms)
Ammonia	A chemical found in water often as the result of discharge of sewage effluents. High levels of ammonia affect fisheries and abstractions for potable water supply
Annex 1A Substance	Substance which has been selected for monitoring on the basis of its persistency, toxicity and ability to bioaccumulate
AOD	Above Ordnance Datum
AONB	Area of Outstanding Natural Beauty. Designated by the Countryside Commission under the National Parks and Access to the Countryside Act 1949, to conserve and enhance the natural beauty of the landscape, through the promotion of good management. At a national and regional level, planning laws protect AONB from major developments, but overall responsibility of care lies with the relevant local authorities. Joint advisory committees are often formed
Aquifer	Rock which holds substantial amounts of water in structure or fissures e.g. chalk, sandstones, limestones
Asset Management Plan 2 (AMP2)	The second Asset Management Plan produced by the water companies for Office of Water Services (OFWAT). It sets out the water industry investment programme for the period 1995-2005
Attenuation feature	A pond designed to store surface water discharges from new development and attenuate (delay) its release. Such ponds can provide environmental enhancements if they are designed sympathetically
Bed Loss	Loss of water through a permeable stream bed
Bioaccumulation	Concentration of pollutants, such as metals, within the tissues of organisms
Blue-green algae	Ubiquitous, usually microscopic plankton with properties characteristic of both bacteria and algae. In still, calm conditions they can grow to excess to form dense blooms and scums, and are known to produce chemicals toxic to mammals
BOD	Biochemical Oxygen Demand
BOD(ATU)	Biochemical Oxygen Demand with nitrification suppressed by allylthiourea
Brown Field Site	Piece of land in rural context that has been subjected to some sort of development, e.g. airfield, landfill etc

Buffer Strip (Bio-buffer)	Strip of land, 10-100 m wide, alongside rivers which is removed from intensive agricultural use and managed to provide appropriate habitat types. Benefits include reduction of inputs into the river such as silt, nutrients, livestock waste, as well as improving habitat diversity and landscape
Bund	A retaining wall designed to contain liquids in the event of failure of their container
Calcareous	Of, or containing, carbonate of lime or sandstone
Carcinogenic	Cancer causing
CDP	Catchment Drainage Plan
CMP	Catchment Management Plan
Coarse fish	This is a lay-man's term for cyprinid fish and other commonly associated species such as pike, perch and eels of angling significance. Does not normally refer to minor species such as bullhead, stone loach, minnow and stickleback
Confluence	The point at which two rivers meet
Consent (Discharge Consent)	A legal document raised by the Environment Agency which specifies the conditions under which a discharge may be made
Conservation Regulations	Usual short title for the Conservation (Natural Habitats, etc) Regulations 1994 (SI No. 2716). These are the UK regulations which 'transpose' the Habitats and Species Directive into UK law
Containment Bund	An earth bank intended to retain liquids
Controlled Waste	Defined by the Control of Pollution Act 1974, Part 1 Section 30. It includes household, industrial and commercial waste
CSO	Combined sewer overflow. A combined sewer is one which takes both surface and foul drainage - usually in older developments
Cyprinid	Fish of the family Cyprinidae (e.g. roach, bream, carp, chub). In the strict sense pike, perch, eel and some other fish species are not cyprinids
Deemed Consent	Under legislation prior to the Water Resources Act 1991, if a consent application was not determined within the statutory timescale then it was 'deemed' granted, so becoming a deemed consent
Derogate	Loss or impairment of water resource, action causing such loss or impairment
DO	Dissolved Oxygen

DoE	Department of the Environment
DWLP	District Wide Local Plan
Dry Weather Flow (DWF)	When sewage flow is mainly domestic in character, the average daily flow to the treatment works during seven consecutive days without rain (excluding a period which includes public or local holidays) following seven days during which the rainfall did not exceed 0.25mm on any one day. With an industrial sewage the dry-weather flow should be based on the flows during five working days if production is limited to that period. Preferably, the flows during two periods in the year, one in the summer and one in the winter, should be averaged to obtain the average dry-weather flow
Eel	Refers to the common eel *Anguilla*
EIFAC	European Inland Fisheries Advisory Commission
Elver	The young stage in the life history of the eel
EN	English Nature
EQS	Environmental Quality Standards. The concentration of a substance found in the environment which should not be exceeded in order to protect the environment or human health. An EQS is set by the EC through EC Directives and also by the government
ESA	Environmentally Sensitive Area (MAFF scheme). A scheme of tiered payments for adopting specific environmentally beneficial farming practices
Eutrophication	Nutrient enrichment of water, e.g. increased nitrogen input leaching into rivers from soil treated with chemicals, this chemical enrichment resulting in increased productivity
"Flashy"	Watercourse which has a rapid response to rainfall. Typically has long periods of low flows and high flows may be several hundred times low flow
Geomorphological	The natural processes which produce river features such as channel form
Groundwater	Underground water that has come mainly from the seepage of surface water and is held in the soil and in pervious rocks
Habit and Species Directive	Usual short title for the European Council Directive on the Conservation of Natural Habitats and of Wild Flora and Fauna (92/43/EEC). Amongst other issues this Directive amended the protection given to Special Protection Areas (SPAs) and created the new European designation Special Area of Conservation (SAC). Sometimes shortened further to the 'Habitats Directive'

HMIP	Her Majesty's Inspectorate of Pollution
Hypolimnion	The lower layer of water in stratified lakes
IFE	Institute of Freshwater Ecology
Improved Pasture	Regularly reseeded grassland on which fertilizers and herbicides are typically applied
LEAP	Local Environment Agency Plan
LNR	Local Nature Reserve. Nature reserves established, and usually managed, by district/borough councils. Local authorities are empowered to designate such sites under the National Parks and Access to the Countryside Act 1949
Macrophyte	Plants clearly visible without the aid of a microscope but excluding lichens, fungi, mosses and algae
MAFF	Ministry of Agriculture, Fisheries and Food
Marly	Rock type made up of marl - a calcareous mudstone
Mutagenic	Causing genetic change which when transmitted to offspring causes heritable abnormal variation
MOD	Ministry of Defence
Natura 2000 sites	A term created under the Habitats and Species Directive which encompasses both the SPA and SAC designations. Sometimes also referred to as 'European sites' or occasionally shortened to 'N2K' sites.
NNR	National Nature Reserve. Sites owned or leased and managed by English Nature and established as reserves under the National Parks and Access to the Countryside Act 1949
Non-Salmonid	See Salmonid - fish not belonging to the salmonid family i.e. coarse fish and minor species
NRA	National Rivers Authority
NSA	Nitrate Sensitive Area. An area around a water supply source designated under Section 94 of the Water Resources Act 1991 where controls on nitrate inputs can be applied
Nutrient	Chemical essential for plant growth, e.g. nitrate, phosphate
NVZ	Nitrate Vulnerable Zone. An area designated under the EC Nitrates Directive to reduce pollution from agricultural sources and prevent further such pollution

Percentile — One of 99 values of a variable dividing its distribution into 100 groups with equal frequencies

Population Equivalent (pe) — The volume and strength of an industrial waste water expressed in terms of an equivalent population, based upon a figure of 0.060 kilogramme BOD per capita per day; the population equivalent of an industrial waste water is therefore calculated using the relationship:

$$\text{population equivalent} = \frac{\text{5-day BOD (mg/l)} \times \text{flow}(m^3/d)}{0.060 \times 10^3}$$

PPG9 — Planning Policy Guidance note on nature conservation produced by the UK government. An essential note explaining how the various directives and regulations should be interpreted

Prescribed Minimum Flow (pmf) — Prescribed minimum flow is the low flow which is used to control abstractions to prevent adverse impact on other users, the environment or water quality

Q95 — The flow that is equalled or exceeded for 95% of the time. It is a low flow but lower flows will be experienced from time to time in very dry periods

RAMSAR sites — International designation (on wetlands) named after the town in Iran where the text of the convention was agreed. The full title of the Ramsar Convention is the 'Convention on Wetlands of International Importance, especially as Waterfowl Habitat'

Reliable Yield — The output capacity of a reservoir, reservoir system, conjunctive use scheme etc. It is the average output (volume/day) that can be sustained through a design drought period. 1976 has been regarded as the critical historical drought sequence, with a risk of occurrence regionally of approximately 1:50 years but current research into extended flow sequences back to the last century and modelling particular water supply schemes suggests that 1975-76 may be much more severe than a 1:50 year sequence

Riffle — Stony or gravelly part of stream or river bed shallow in dry flow (opposite of pool). Fast streams on most non-chalk areas have alternating riffles and pools

Riparian Owner — Owner of land next to river; normally owns river bed and rights to mid-line of channel

RQO — River Quality Objective. Use-related targets for chemical water quality used by the Agency to maintain or improve the quality of controlled waters

RSPB — Royal Society for the Protection of Birds

SAC	Special Area of Conservation. An area designated under the EC Habitats Species Directive for the conservation of natural habitats, wild flora and fauna
Salmonid	Fish belonging to the family Salmonidae (salmon, trout, grayling)
SAM	Scheduled Ancient Monument. Sites of national importance designated under the Ancient Monuments and Archaeological Areas Act 1979
Semi-Improved Pasture	Reseeded or undisturbed grassland which contains some species typical of unimproved pasture. Receives relatively little artificial fertilizers or herbicides
SLA	Special Landscape Area. Areas of special landscape quality, designated by the County (ie not nationally endorsed), justifying the adoption, by the County, of particular development control policies and other safeguarding measures
SNCI	Sites of Nature Conservation Interest. Sites selected (usually by County Trusts) as sites of 'County' ecological importance
Source	Point of abstraction of water, eg well, borehole, spring
SPA	Special Protection Area. Sites identified by UK Government under the EC Directive on the Conservation of Wild Birds (79/409/EC)
SSSI	Site of Special Scientific Interest is the term used to denote an area of land notified under Section 28 of the Wildlife and Countryside Act 1981 (as amended) as being of special nature conservation or geological interest due to its flora, fauna and/or features of geological interest
STW	Sewage Treatment Works
Substrate	Material making up bed and underwater part of banks of stream. Gravels, silts etc
Surface Water	General term used to describe all the water features such as rivers, streams, springs, ponds and lakes
SWQO	Statutory Water Quality Objectives (legally enforceable RQOs)
SWT	Somerset Wildlife Trust
Teratogenic	Causing abnormal monster growth in organisms
Unimproved Pasture	Permanent grassland which has not been disturbed for many decades and typically receives no artificial fertilizers or herbicides. Rich in grasses, sedges and flowers

Unsaturated Zone	That part of an aquifer, above the water table, in which cracks, fissures and other large voids are normally air-filled
Weil's Disease	Also known as Leptospirosis - disease associated with rats' urine. Infection can enter through broken skin or eyes, nose, mouth, etc. River users may be at risk
WOAD	Welsh Office Agriculture Department
WWSL	Wessex Water Services Ltd

Units

%ile	Percentile
%sat	% saturation (of oxygen)
km	Kilometre
km²	Square kilometres
m	Metre
mm	Millimetre
mg/l	Milligrams per litre (one milligram = 0.001 grams)
m³/d	Cubic metres per day
Ml/a	Megalitres per year (one million litres per year)
Ml/d	Megalitres/day (one million litres per day)
ng/l	Nanograms per litre (one nanogram = 0.000,000,001 grams)
ppm	Parts per million
ppb	Parts per billion
µg/l	Micrograms per litre (one microgram = 0.000,001 grams)
<	Less than
>	Greater than

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.

GENERAL CONDITION OF PUMPING STATIONS ON THE PARRETT SYSTEM

The following is a review of the plant identifying the general condition as of January 1997, and the need for significant refurbishment of all or part of a system. It must be understood that ALL sites require maintenance, preferably planned, to reduce failures and improve efficiency and value for money, and that the review is independent of any routine maintenance we may undertake.

1 Henley

This pumping plant provides summer irrigation water to the upper reaches of the river Cary. Two submersible electric pumps provide 0.22 cubic metres per second.

The M&E plant was installed in 1971 and was at the limit of its design life in 1996. There have been, over the past six years, some minor failures of the control equipment and some electrical safety improvements made. It will be necessary to refurbish both pump units and their controls within the next five years.

2 Midelney

The station drains a catchment of approximately 22 sq km using three electrically driven pumps discharging 3.3 cubic metres per second.

The plant was installed in 1963 and has over the past six years had a number of minor failures indicative of ageing control equipment. It is believed that all three pump and motor units have been refurbished in the past ten years but the electrical control and distribution equipment is original and increasingly difficult to maintain. The internal domestic wiring and some parts of the control equipment have been or are being replaced.

There is an immediate need to refurbish the distribution, control and auxiliary equipment which may result in the replacement of the main pump motors.

3 West Sedgemoor

This station drains a catchment of approximately 44.5 sq km. This station has an installed capacity of 5.6 cubic metres per second; electric motor driven pumps installed in 1996 giving 4.4 cubic metres per second and one submersible variable speed electric powered pump installed in 1988, delivering up to 1.2 cubic metres per second.

The electric pump was fully refurbished in 1994 and is currently being refurbished following an in-service failure. The automation and controls are currently being replaced although commissioning and setting up of automatic systems is not completed.

4 Westover

The station drains a catchment of approx 10 sq km using two electrically driven pumps discharging 1.86 cubic metres per second.

The plant was installed in 1965 and has over the past six years had a number of failures indicative of ageing control equipment. One pump and motor unit was refurbished in 1996

but the electrical control and distribution equipment is original and increasingly difficult to maintain.

There is an immediate need to refurbish the distribution, control and auxiliary equipment which may result in the replacement of the main pump motors.

5 Huish Episcopi

The station drains a catchment of approx 30 sq km using three electrically driven pumps discharging 5.1 cubic metres per second.

The plant was installed in 1963 and has over the past six years had a considerable number of failures indicative of ageing control equipment. One pump and motor unit is currently being refurbished following major failure.

There is an immediate need to refurbish the distribution, control and auxiliary equipment which may result in the replacement of the main pump motors.

6 Long Load

This station drains approx 33 sq km using three electrically powered pumps; two pumps discharge 4.4 cubic metres per second and were installed in 1977 the other pump was installed in 1993 with a capacity of 0.6 cubic metres per second. The electrical controls were completely replaced in 1993.

Over the next ten years it will be necessary to refurbish the two large pumps.

7 Stockmoor

This station drains 7 sq km using two electrically powered pumps one installed in 1977 and one in 1995; one pump discharges 1 cubic metres per second and the other 0.42 cubic metres per second. The smaller pump carries out most of the pumping duty.

The large pump drive motor has been refurbished in 1996. The small pump is currently being maintained following in-service failure, this is subject to a warrantee claim. The site automations is unreliable and their is no telemetry monitoring the controls this should be upgraded within the next ten years.

8 North Moor

This station drains 20 sq km using two electric submersible pumps with a combined capacity of 2.2 cubic metres per second both pumps were installed in 1996. The original diesel pumps also with a capacity of 2.2 cubic metres per second are available for use in the event of emergency or power failure.

The maintenance of the diesel engines is very difficult, both spares and expertise are difficult to obtain with some critical components unobtainable. We have experienced long down times awaiting spares for minor breakdowns and have had some difficulties with the quality of maintenance work. The safety of the operation of the plant does not meet current regulations and we are currently looking to modify equipment and enhance guarding.

Both diesel engines require immediate refurbishment and all existing auxiliaries require replacement or modification.

9 Salt Moor

This station has two electrically powered pumps to drain approximately 2.47 sq km. The pumps were installed in 1991 to deliver 0.5 cubic metres per second and the original diesel driven pump installed in 1942 to deliver 0.425 cubic metres per second.

The electric pumps and controls are fully automated but some work remains to correct problems arising from the original design of the station. The diesel pump is only used as stand by and has a number of recurring defects.

Both electric pumps will require removal and refurbishment within ten years. The diesel engine requires immediate refurbishment.

10 Stanmoor

This station has three pumps to drain approximately 4 sq km, one diesel pump installed in 1949 with a capacity of 0.453 cubic metres per second and two electrically powered pumps with a combined capacity of 0.452 cubic metres per second.

The electrically powered pumps carry out most of the pumping duty and were fully refurbished in 1994, the electrical controls were replaced in 1995.

The diesel engine and auxiliaries have caused repeated problems. The diesel powered pump unit requires immediate refurbishment.

11 Westonzoyland

This is a single diesel driven pump installed in 1947 to drain approximately 10.4 sq km with a capacity of 1 cubic metre per second.

There have been a number of major breakdowns, but we are fortunate to have access to a complete spare engine and the design is similar to modern diesel engines making expertise easier to obtain.

12 Currymoor

There are three pumps on this site draining a catchment of approximately 15.47 sq km. Two diesel driven pumps were installed in 1955 with a combined capacity of 3.12 cubic metres per second and one electrically driven Archimedean screw pump delivering 0.35 cubic metres per second installed in 1983.

The No. 1 pump failed in service in 1992/3 and was out of action for 4 months whilst it was repaired and refurbished. The No. 2 pump had a planned refurbishment in 1994. The No. 2 diesel engine was fully inspected and overhauled in 1994. The No. 1 diesel engine was refurbished in 1995. Most of the required auxiliaries have been replaced recently. The standby electrical generator was stolen in 1996 and has yet to be replaced.

The electric pump will require refurbishment of screw and controls within ten years. The long term viability of the diesel engines beyond a ten year period is doubtful given the increasing difficulty in obtaining spares and services.

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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