

RIVER SEVERN - UPPER REACHES CATCHMENT MANAGEMENT PLAN CONSULTATION REPORT NOVEMBER 1994



NRA

*National Rivers Authority
Severn-Trent Region*

**NATIONAL RIVERS AUTHORITY
SEVERN-TRENT REGION**

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**RIVER SEVERN - UPPER REACHES
CATCHMENT MANAGEMENT PLAN**

CONSULTATION REPORT

NOVEMBER 1994

National Rivers Authority
Upper Severn Area
Hafren House
Welshpool Road
Shelton
SHREWSBURY
Shropshire SY3 8BB



ENVIRONMENT AGENCY



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The Catchment Management Planning Officer
National Rivers Authority
Upper Severn Area
Hafren House
Welshpool Road
SHREWSBURY
Shropshire SY3 8BB

Telephone Enquiries: Shrewsbury (0743 272828)

November 1994

FOREWORD

The National Rivers Authority was created in 1989 to preserve and enhance the natural water environment and to protect people and property from flooding. In its role as 'Guardian of the Water Environment', the NRA is committed to preparing a sound plan for the future management of the region's river catchments.

This Consultation Report is the first stage in the catchment management planning process for the upper reaches of the River Severn. It provides a framework for consultation and also a means of seeking commitment from those involved to realise the full environmental potential of the Catchment.

We look forward to receiving comments and contributions from interested organisations and individuals. These will enable a Final Plan to be produced, balancing the conflicting demands placed upon the natural water environment.

Dr J H Kalicki
Area Manager
Upper Severn Area

THE NRA's VISION FOR THE CATCHMENT

The catchment of the upper reaches of the River Severn is predominantly rural in character, and is an area known for its attractive upland landscape and great natural beauty. The rivers in the catchment support high class fisheries and provide a diversity of habitats for a wide range of flora and fauna.

The catchment is home to around 75,000 people, who depend on the water environment in many ways and value it for the amenities and enjoyment it provides for their local communities. The picturesque and unspoilt countryside within the catchment is also increasingly seen as a tourist attraction.

The catchment has an important role far beyond its physical boundaries, and indirectly affects many people who live outside the catchment. One reason is the plentiful high quality water in its rivers and lakes, which is used as a major source of water supply to surrounding areas. Also of note is the fact that the catchment comprises the upper parts of the longest river in Britain. What occurs in these sensitive upper reaches can have an impact downstream for up to a distance of some 350 kilometres.

The NRA's vision for the catchment is to:

- * safeguard existing high quality water and habitats, and where appropriate work towards enhancing the water environment.
- * work in an integrated manner towards resolving those issues and problems that have been identified in the plan.
- * ensure that future demands on the water environment from both within and outside the catchment are planned and managed in a balanced and sustainable way for the benefit of all users.

Key objectives of this plan are to:

- * maintain the highest possible level of protection for the water environment, restore damaged habitats and protect rare and threatened species.
- * address the problem of stream acidification.
- * improve water quality of the 41 km of rivers where the required longer-term River Ecosystem water quality objective is not already achieved.
- * improve fisheries by making spawning areas in rivers more accessible to migratory fish.
- * ensure proper management of the catchment's valuable water resources.
- * influence the planning processes of local authorities to ensure that development does not adversely impact on, and wherever possible proceeds in a way to benefit, the water environment.

The realisation of the NRA's vision will be achieved through a balanced management approach to all activities in collaboration with all users of the catchment. It is our intention to work in partnership with all relevant agencies and representative organisations to promote and achieve an integrated approach to managing the catchment. The plan will ensure required improvements can be carried out, and future demands catered for, in a sustainable manner.

CONTENTS

- RIVER SEVERN - UPPER REACHES CATCHMENT MANAGEMENT PLAN

PAGE NO.

	THE NRA'S VISION FOR THE CATCHMENT	i
PART I	THE CONSULTATION REPORT	
SECTION 1.0	CONCEPT OF THE CATCHMENT MANAGEMENT PLAN	1
1.1	Concept	1
1.2	Consultation	2
SECTION 2.0	AN OVERVIEW OF THE CATCHMENT	3
2.1	Catchment Description	4
2.2	Data Collection within the Catchment	10
2.3	Key Details	12
SECTION 3.0	ISSUES AND OPTIONS	14
3.1	Issues identified	15
3.2	A description of the Issues facing the catchment	16
3.3	A summary of the Issues, and Options for action	36
PART II	SUPPORTING INFORMATION	
SECTION 4.0	USES OF THE CATCHMENT	61
4.1	Development - Housing, Industry, Commerce and Infrastructure	62
4.2	Abstraction - Surface Water and Groundwater	66
4.3	Strategic Water Resource Use	70
4.4	Hydropower and Renewable Energy	73
4.5	Sewage and Industrial Effluent Disposal	76
4.6	Solid Waste Disposal	78
4.7	Mineral Working	81
4.8	Agriculture	84
4.9	Forestry	87
4.10	Flood Water Conveyance and Storage	90
4.11	Fisheries-Ecosystem	93
4.12	Angling	96
4.13	Conservation - Ecology	98
4.14	Conservation - Landscape, Archaeology and Heritage	101
4.15	Amenity and Recreation	103
4.16	Boating, Navigation and Watersports	105

	PAGE NO.
SECTION 5.0 CATCHMENT TARGETS	107
5.1 Surface Water Quality Targets	108
5.2 Groundwater Protection Targets	113
5.3 Water Quantity Targets	115
5.4 Physical Features Targets	118
SECTION 6.0 CURRENT STATE OF THE CATCHMENT	123
6.1 Surface Water Quality	124
6.2 Groundwater	128
6.3 Water Quantity	130
6.4 Physical Features	134
APPENDIX 1: FLOOD DEFENCE ROLES	139
APPENDIX 2: GUIDANCE NOTES FOR LOCAL PLANNING AUTHORITIES	141
APPENDIX 3: A BIOLOGICAL COMPONENT OF THE GENERAL QUALITY ASSESSMENT SCHEME	150
B. CHEMISTRY COMPONENT OF THE GENERAL QUALITY ASSESSMENT SCHEME	152
APPENDIX 4: NATIONAL ENVIRONMENTAL QUALITY STANDARDS FOR LIST II SUBSTANCES	154
APPENDIX 5: GROUNDWATER OBSERVATION POINTS	156
APPENDIX 6: LIST OF ORGANISATIONS RESPONDING TO ISSUES CONSULTATION	157
APPENDIX 7: REFERENCES/BIBLIOGRAPHY	158
APPENDIX 8: GLOSSARY	160

INDEX OF MAPS

Map No.	Title	Opp Page No.
1	Catchment River Network	4
2	Location of River Level, Flow Measurement and Rainfall Telemetry Stations	11
3	Water Quality Monitoring Points	12
4	Administrative Boundaries and Infrastructure	62
5	Licensed Groundwater Abstractions and Groundwater Units	67
6	Licensed Surface Water Abstractions	68
7	Strategic Water Resource Use	70
8	Sewage and Trade Discharges	76
9	Waste Disposal Sites	78
10	Mineral Sites, Quarries and Mines	81
11	Land Use	84
12	Acid Sensitive Areas	87
13	Flood Alleviation Schemes and Flood Warnings	90
14	EC Designated and other Important Fisheries	93
15	Angling Waters	96
16	Conservation - Ecology	98
17	Landscape, Archaeology and Heritage	101
18	Caravan Sites	104
19	Recreation and Navigation	105
20	River Ecosystem Water Quality Objectives for CMP period	108
21	Flood Defence Land Use Bands	121
22	General Quality Assessment - 1993 Chemistry Component	124
23	General Quality Assessment - 1993 Biological Component	127
24	Groundwater Vulnerability	128
25	Salmon Distribution and Density	135
26	Trout Distribution and Density	136
27	Main River	137

TABLES AND FIGURES

		Page No.
Figure 1	Land Use Classification	6
Table 1	Local Planning Authorities and Development Plans	65
Table 2	Summary of Abstraction Licences in the catchment	67
Table 3	Abstraction Restrictions dependent on Prescribed Flows	68
Table 4	Catchment Land Use details	86
Table 5	River Ecosystem Classification : Water Quality Criteria	110
Table 6	ECDirectives Summary	110
Table 7	River Ecosystem Water Quality Class Objectives	111
Table 8	Indicative Standards of Protection for Flood Defence	122
Table 9	General Quality Assessment - 1993 Summary	126
Table 10	Exceedences of Environmental Quality Standards for Dangerous Substances	127
Table 11	Reliability of River Flows	131
Table 12	Flooding Problems (1990 Survey)	138

PART I

THE CONSULTATION REPORT

SECTION 1.0 CONCEPT OF THE

CATCHMENT MANAGEMENT PLAN

1.0 CONCEPT OF THE CATCHMENT MANAGEMENT PLAN

1.1 CONCEPT

Never before have the rivers, lakes, estuaries and coastal waters of England and Wales been subject to such large and rapidly increasing demands from the users of water. Many different uses interact, or compete for water or water space, and will inevitably come into conflict with one another. The NRA is the major manager of the water environment in England and Wales and aims to reconcile conflicts between water users as well as its general duties that include:-

- * Control of pollution and improving the quality of rivers, canals, groundwaters and coastal waters.
- * Flood defence, including the protection of people and property.
- * Flood forecasting and flood warning.
- * Effective management of water resources.
- * Maintenance, development and improvement of fisheries.
- * Promoting the conservation of the natural water environment.
- * Promotion of water-based recreation.
- * Navigation (in some areas).

Catchment Management Plans (CMPs) allow the NRA to balance the competing requirements and interests of all users. The process allows the environmental potential of a catchment to be realised in terms of water quality, water quantity and physical features. In the future, CMPs will provide the framework within which the NRA can implement the new system of Water Quality Objectives (WQOs). These objectives are use-related and may be given a statutory status following public consultation and agreement by the Secretary of State. Section 5.1 gives further details of the WQO scheme.

The CMPs set out the NRA's vision for the future of individual river catchments. A river catchment is a discrete geographical area which is drained by a single surface water system. The 21,600 square kilometres covered by the Severn-Trent Region of the NRA consists of only two principal catchments, the River Severn and the River Trent. Due to their large surface area, they have been divided for management purposes into sub-catchments.

The Catchment Management Plan consists an analysis of the issues affecting each catchment, with proposed actions to resolve them. Many of the issues can only be addressed with the co-operation or assistance of other people or organisations, so the preparation of CMPs must involve consultation with local communities and other interested parties. An early stage in the CMP process is the Consultation Report. This Report is laid out as follows:

Vision for the Catchment: A short summary of the NRA's long term ambitions for the Catchment.

Catchment Overview: This section gives a brief description of the Catchment.

- Issues and Options:** For each issue, the nature of the problem is discussed. Options for resolving the problems are suggested, together with benefits and constraints. The bodies responsible for actions are identified, together with sites for action.
- Supporting Information:** This details the Uses of the Catchment, the Catchment Targets and the Current State of the Catchment.
- Appendices:** Some technical appendices are included for reference

1.2 CONSULTATION

This report is intended to form a basis for consultation between the NRA and all those with interests in the catchment. Consultees may wish to:

- * comment on the Vision for the Catchment.
- * comment on the issues and options identified in the report.
- * suggest alternative options for resolving identified issues.
- * raise additional issues not identified in the report.
- * comment on the priority of issues.

Following the consultation period all comments received on the Consultation Report will be considered in preparing the next phase, the Final Plan. This Consultation Report will not be rewritten as part of the Final Plan process. The Final Plan will form the basis for the NRA's actions in the Catchment by outlining areas of work and investment proposed by the NRA and others. Timescales, targets and estimated costs will be added at this final stage. It is the NRA's intention that the Plan should influence the policies and action of developers and planning authorities as well as assisting in the day to day management of the catchment.

A short issues document was sent to Local Authorities, National Organisations and other representative bodies in May 1994. Their comments have been incorporated into this document where possible. A list of organisations that commented is given in Appendix 6. The NRA is grateful for the useful suggestions received.

Comments on the Consultation Report should be made in writing by Friday 3 February 1995 and sent to:

Dr J H Kalicki, Area Manager
NRA Upper Severn Area
Hafren House
Welshpool Road
Shelton
SHREWSBURY
Shropshire SY3 8BB

If you or your organisation need further information, please contact Mrs D Murray at the above address or by telephone on 0743 272828.

SECTION 2.0 AN OVERVIEW OF THE CATCHMENT

Catchment River Network

Map 1



KEY

- Catchment Boundary
- Canal

2.1 CATCHMENT DESCRIPTION

Introduction

This plan considers the upper reaches of the Severn Catchment, and includes the River Severn and lakes and tributaries from its source in Powys to where it is joined by the River Perry some 6 km to the north west of Shrewsbury. The whole of the Severn has a total catchment area of 11,420 km², with a population of 2.5 million.

The catchment of the upper reaches of the River Severn drains an area of 2,065 km², and has a population of just under 75,000. The most populated parts of the catchment are in the eastern and southern areas. Almost 86% of the catchment lies within Wales. Details of the administrative boundaries, together with information on Local Authority Development Plans, are given in Section 4.1. Further information is also given in the Key Details on Page 12.

The catchment is predominantly rural in character, and is an area known for its attractive upland landscape and natural beauty. The River Severn corridor is one of the most important environmental features of the Welsh Border area. Tourism is increasingly becoming an important activity within the catchment, and the River Severn, together with its tributaries, is an amenity being increasingly enjoyed by many people. The rivers and canals in the catchment support high class fisheries and provide habitats for a wide range of flora and fauna such as floating water plantain, otters and crayfish.

The high standard of water quality, together with the reliable and large quantities of winter water, make this catchment one of the most important in the country for water resources. The River Severn is an important source of domestic water supply for surrounding areas, and extensive abstraction takes place further downstream. Llyn Clywedog and Lake Vyrnwy reservoirs are situated near the western edge of the catchment. Llyn Clywedog, which was built between 1964 and 1967, supports the provision of water supplies to 6 million people, and Lake Vyrnwy has supplied water to north west England since the scheme was commissioned in 1892.

During the winter river flows are adequate but in summer flows often need to be topped up so that there is enough water available for vital water supplies. This is done by releasing water from Llyn Clywedog and sometimes from Lake Vyrnwy. Additional water can be pumped into the River Severn from the Shropshire Groundwater Scheme boreholes sited in the sandstone in the north east of the catchment

The Severn-Vyrnwy confluence area is one of the major flood plain environments in the catchment, and is of national importance for wading birds and overwintering wildfowl. As the catchment is predominantly hilly, there is often pressure for development in lower lying flood plain areas. These areas and river banks need protection from the impacts of development.

The protection of the existing high quality water resources from the effects of land use changes and pressures for development is of vital importance in the catchment.

Topography

The catchment is dominated on its western edge by the northern end of the Cambrian mountain range. Drainage from these mountains flows generally eastwards in deeply incised valleys through the rounded hill country that extends over almost 90% of the catchment. Moving eastwards, the hills give way to the Shropshire Plain, which includes areas of extensive flood plain at the confluence of the two principal rivers, the Severn and Vyrnwy, at the foot of the Breidden Hills.

The River Severn rises on the north eastern slopes of Bryn-Cras, one of the peaks of Plynlimon on the western border of Powys, just 25 km from Aberystwyth. It is only 3 km from the source of the River Wye, and 613 metres above sea level. By the time the Severn reaches Llanidloes only 19 km to the east, it has dropped 457 metres. The Severn then flows north-eastwards until it meets the River Vyrnwy, where it turns to follow the Vyrnwy's generally easterly direction. The total length of the River Severn to the point where it is joined by the River Perry on the downstream boundary is 112.4 km.

Overall, the catchment falls from 741 metres above sea level at Pen Pumlumon Arwystli (Plynlimon) to 55 metres above sea level at the downstream boundary near Montford Bridge, west of Shrewsbury.

The catchment has a wide variety of attractive landscape types, ranging from the flat low lying Severn-Vyrnwy flood plain in the east, through undulating hills to the moorland plateaux of the Berwyn Mountains in the west. The river valleys are an important feature of the landscape.

Land Use

The catchment is predominantly rural, with agriculture being the main land use.

Satellite data (LANDSAT) shows that upland pasture accounts for about a third of the catchment area. Sheep farming is widespread in the western uplands, and dairy farming predominates in the river valleys. Arable farming (17% of the catchment area) is mainly concentrated to the north and east of the River Severn and also on lower lying land along the main west-east river valleys.

Forestry constitutes a major land use in the catchment. Satellite data shows that approximately 10% of the catchment area is woodland, the majority being coniferous and in the west of the catchment.

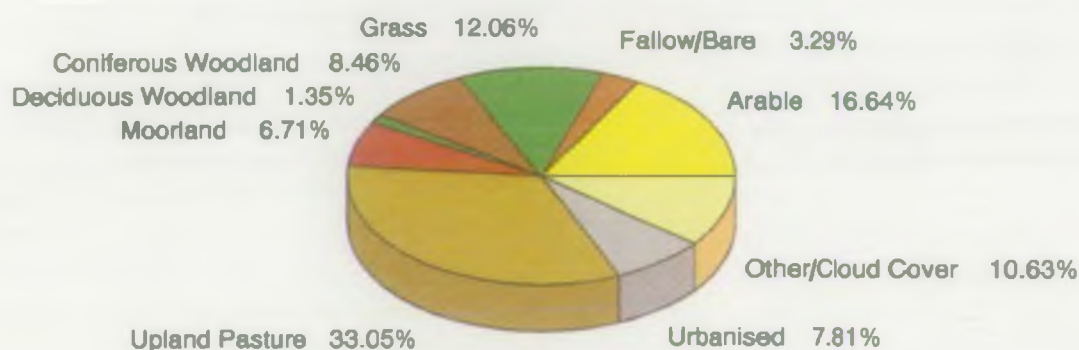
Urban development within the catchment is characterised mainly by market towns and local administrative centres, many with business parks and light industrial estates. These towns and most of the population are located mainly in the eastern and southern parts of the catchment. There is very little major industry in the catchment, but there are a number of quarries used mainly for extraction of stone for road construction.

Figure 1 shows the proportion of Land Use classifications in the catchment based on statistics from LANDSAT. Full details of land use are shown in Table 4 and Map 11

CATCHMENT OVERVIEW

(LANDSAT image) in Section 4.8. It should be noted that just over 10% of the area was under cloud cover, therefore actual percentages may be greater.

Figure 1-Land Use Classification



Geology

The geology of the catchment is dominated by strata from the Ordovician and Silurian periods, which were deposited between 510 and 405 million years ago. The older Ordovician strata comprise mainly mudstones and shales, with thin interbedded sandstones, conglomerates and limestones. The Silurian period is predominantly represented by mudstones, with subordinate sandstones and limestones.

The bedrock in the north east of the catchment is the Permian Bridgnorth and Triassic Sherwood Sandstone Formations, a thick sequence of poorly cemented sandstones with interbedded thin marls and conglomerates. These were laid down under warm desert climatic conditions which existed in Britain from 290 to 230 million years ago.

Separating the Permo - Triassic Sandstones from the Silurian mudstones to the south-west of Oswestry is a relatively small area of strata of Carboniferous age (355 to 290 million years ago), including Carboniferous Limestone, Millstone Grit and Coal Measures.

Overlying much of the Carboniferous and Permo - Triassic strata is a cover of glacial and post-glacial sands, gravel and boulder clays. The superficial deposits in the areas of the Ordovician and Silurian strata are primarily alluvium and river terrace gravels occupying the valleys of the surface watercourses.

Hydrology

Annual rainfall varies from over 2500mm per annum along parts of the main divide from Plynlimon to the Berwyns, to only 660mm per annum at the lowest point of the catchment just to the west of Shrewsbury. The variation is not evenly distributed, however, with most of the Vale of Powys receiving less than 1000mm per annum.

Rainfall increases rapidly with height to the west of the Vale of Powys and, as altitude increases, exhibits a marked winter maximum. This is caused by the strong, moist south west airstreams in the winter being uplifted over the mountains to create plentiful 'orographic' rainfall.

The available *effective* rainfall, after allowing for evaporation losses and transpiration, varies from around 1500mm along the western ridge to less than 200mm in the lowlands.

River flows in winter reflect the rainfall distribution, with frequent flooding occurring from the numerous mountain streams as water accumulates in the flatter vales and around the Severn-Vyrnwy confluence. Summer flows are unreliable from the mountain streams, but progressively increase in reliability downstream of valley gravels and, particularly, downstream of sandstone groundwater storage. Artificial augmentation of river flows is practised in the rivers Severn and Vyrnwy.

Surface Water Quality

The Upper Severn contains the highest proportion of top grade rivers within the Severn-Trent Region. The 1993 General Quality Assessment (GQA) of water quality covered approximately 400km of river and canal, with 93% achieving the category of Good, (Grades A & B for the chemistry component and Grade A for the biological component). With their high dissolved oxygen and high velocity, the rivers support a diverse fauna with stoneflies, mayflies and caddisflies being found in large numbers.

This high quality water provides a perfect basis for a wide range of aquatic habitats for birds and animals and extensive salmonid and cyprinid fisheries, many of which are EC designated. The high quality of the water enables large scale abstraction for drinking water to take place within the catchment, and equally important downstream in neighbouring catchments.

Headwaters of many streams and rivers along the western uplands are affected by either acid run-off or drainage from abandoned metalliferous mines, and in some cases, both.

Ground and Surface Water Systems

The Permo-Triassic Sandstones are the primary aquifer in the catchment, but they are limited in extent to a small area in the north east of the catchment (see Map 5). The sandstones are highly permeable and able to sustain high and reliable yields. The groundwater is utilised for Public Water Supply, agricultural purposes and for flow augmentation of the River Severn via the Shropshire Groundwater Scheme. Groundwater

CATCHMENT OVERVIEW

from the sandstone also provides natural baseflow to support rivers and streams during dry periods.

Among the Ordovician, Silurian and Carboniferous strata, groundwater occurs in the more permeable, highly weathered and fractured rocks. It is used by private abstractors primarily for domestic and small agricultural supplies. The mudstones and shales provide negligible quantities of groundwater.

The sand and gravel horizons in the superficial deposits are thin and variable in composition. Water can flow through them easily so that they can be important in supplying local needs, as well as providing baseflows to rivers and streams and sustaining wetlands and marsh areas along the valley margins.

Surface water streams from the mountains are steep and flashy. They locally benefit from undrained upland peat hags (known locally as "ffridd") which are the main natural sources of upland surface water in the mountains during severe droughts.

Streams and canals are used widely for cattle watering and wet fencing, and also for private domestic water supplies for farmsteads. The main lowland rivers, Severn and Vyrnwy, are slow moving in summer and provide abundant riparian meadows along their extensive flood plains.

Some of the larger upland rivers, such as the Banwy and Rhiw, have mobile gravel beds, below which the river level may fall during severe summer droughts.

Flood Defence

The Severn and its tributaries are prone to regular flooding, with floods of major note in 1946, 1947, 1948, 1960, 1964, 1965 and 1968.

The NRA's flood defence powers relate to the control of structures on all watercourses, and the carrying out of maintenance and improvement schemes on Main River. The extent of Main River is shown on Map 27.

In addition to continuous records at gauging stations, there are flood level records at significant points throughout the catchment, usually adjacent to structures such as bridges. Aerial photographs were taken of the 1948, 1960, 1990 and 1993 floods, but were confined to the lower reaches of the catchment. On watercourses which are not Main River ('ordinary watercourses'), information is not so detailed and the extent of flood plains has not been mapped. There are 277 km of Main River in the catchment.

Flood defence works were built following the floods in the 1960s to alleviate the risk to property and land within the catchment, specifically at Caersws, Meifod and Newtown. A comprehensive system of over 50 km of embankments (known locally as argaes) provide limited protection to over 5,000 hectares of land upstream of the confluence of the Rivers Severn and Vyrnwy.

Where catchment response times allow, a flood warning scheme operates to lessen the

CATCHMENT OVERVIEW

damage from floods. Warnings are issued by the NRA on the River Severn downstream from Llandinam, and on the River Vyrnwy downstream from Newbridge, Meifod. Map 13 shows the locations of the flood alleviation schemes and flood warning reaches.

The NRA undertakes maintenance works in main river channels, including dredging, tree and brush work, debris removal and weed cutting. These all help to maintain the flow capacity of the river. The NRA issues consents for structures in, over, under or near a watercourse and works through the Local Planning Authority to control developments in the flood plain or those likely to cause flooding problems.

Fisheries

The catchment is characterised by having many high quality and unspoilt fishery habitats, most of which are designated salmonid fisheries under EC Directive (78/659/EEC). Preservation of these high quality and relatively pristine resources is one of the most important fisheries issues for the NRA to address in the Upper Severn area. Salmon, trout and grayling dominate in most watercourses, but cyprinids also occur especially in the River Severn. The Montgomery Branch of the Shropshire Union Canal is a EC designated cyprinid fishery throughout its length.

Most of the salmon spawning grounds for the River Severn salmon stocks occur in the catchment, together with salmon rod fisheries primarily in the River Severn and River Vyrnwy. Good stocks of wild brown trout also exist, particularly in tributaries such as the Afon Dulas, River Mule, Afon Carno and River Camlad. A number of stillwater trout fisheries are also located in the catchment, most notably Llyn Clywedog and Lake Vyrnwy.

Conservation and Recreation

The wide range of landscape types within the catchment, ranging from plateaux to narrow valleys and flood plain, supports an equally wide range of habitats. Consequently the conservation value of the catchment is reflected in the number of designated sites. There is a total of 77 Sites of Special Scientific Interest (SSSIs), of which 49 are water related. These include blanket bog, mires, fen, wet meadow, carr woodland, lakes and the Montgomery Canal. There are also a number of woodlands which have streams or rivers running through them, and four geological sites occur along the sides of streams: a section of the River Severn itself is a proposed SSSI on geomorphological grounds.

Settlement within the catchment has been focused on the major rivers and in particular the Severn, illustrating their importance for communication and trade and later as a power source for a variety of industries. The Border area itself and these river valleys have also been important in terms of defence, and the area's long history is reflected in a wealth of archaeological sites.

Recreational activities in the catchment include angling, canoeing, ornithology, sailing and walking. At present there is relatively limited use of the catchment for these activities other than for angling. However, increasing pressures from tourism are likely to lead to a greater demand for recreational facilities in the future.

2.2 DATA COLLECTION WITHIN THE CATCHMENT

River Levels and Flows

River levels are measured continuously at 28 gauging stations each equipped with a chart recorder and also with remotely monitored data loggers which are regularly downloaded by the NRA's computer - based river forecasting system.

River flows are regularly measured at 8 stations and are archived for analysis as well as being available operationally for abstraction control and flood monitoring.

Rainfall

Rainfall is measured by 35 daily and 8 monthly gauges. These are read by observers who send returns monthly for data quality control and archiving. In addition 10 automatic raingauges record short duration intensity on data loggers and are also contacted by the computer-based forecasting system. Clee Hill weather radar (near Ludlow), although outside the catchment, provides good coverage for real-time rainfall data used for river regulation and flood forecasting.

Groundwater Levels and other monitoring

A network of 30 observation boreholes is maintained to monitor groundwater levels. These sites are either dipped manually once per month (21 no.), or are equipped with data loggers (9 no.) for continuous monitoring. In addition, 10 tubewells are monitored to measure variations in shallow water tables - mostly in the north eastern part of the catchment near to the Shropshire Groundwater Scheme boreholes. Details are given in Appendix 5. 3 pools linked to groundwater are also monitored.

A small number of reservoir water level gauges and seismic monitors together with dam instrumentation to ensure structural integrity are in use at Clywedog and Vyrnwy dams and reservoirs. In addition, some river level sites are equipped with river water temperature gauges and/or fish counter data loggers.

Some automatic rainfall sites are equipped with supplementary wind/temperature sensors used for snowpack melt rates during flood forecasting. There are a small number of specially trained snow observers who calculate the water equivalent of lying snowpacks during periods of high flood risk.

Water Quality

Water quality samples are taken regularly from a network of 46 river and canal sites (Map 3). These are analysed for a wide range of substances to assess compliance with EC Directives UK quality Objectives and for General Quality Assessment. Consented discharges are also sampled and analysed routinely to ensure standards set by the NRA are

being achieved.

To assess the impact of, and sensitivity to, the effects of acidification 61 sites are sampled and analysed. Some of this work is carried out in co-operation with the Institute of Hydrology, Plynlimon.

Historically groundwater has not been extensively monitored in the catchment. However, the development of the Shropshire Groundwater Scheme along the North Eastern boundary of the catchment has initiated sampling and analysis of boreholes in this area to assess the impact of support water on the receiving River Severn.

Routine assessments are made of the potential impact of new and existing development on water quality. Regular inspections are then carried out at high risk sites as part of the Authority's pollution prevention programme. Typical site types include farms, industrial premises, waste disposal sites and sewage installations.

Biological Monitoring

Biological monitoring is undertaken at 43 river sites, which are matched with water quality chemical sites. Currently each site is sampled three times per year. However, this may be reduced to twice per year to allow for more individual river catchment surveys. Individual river catchment surveys are currently undertaken on an ad-hoc basis to either investigate poor routine site results or to assess the impact of a pollution incident.

A further 30 sites are sampled at varying frequencies, 25 to assess acidification impact and 5 to assess abandoned metalliferous mine drainage impact. An assessment of the Biological quality is made by analysing the species of insects and other small aquatic life that are present.

Fish Stocks

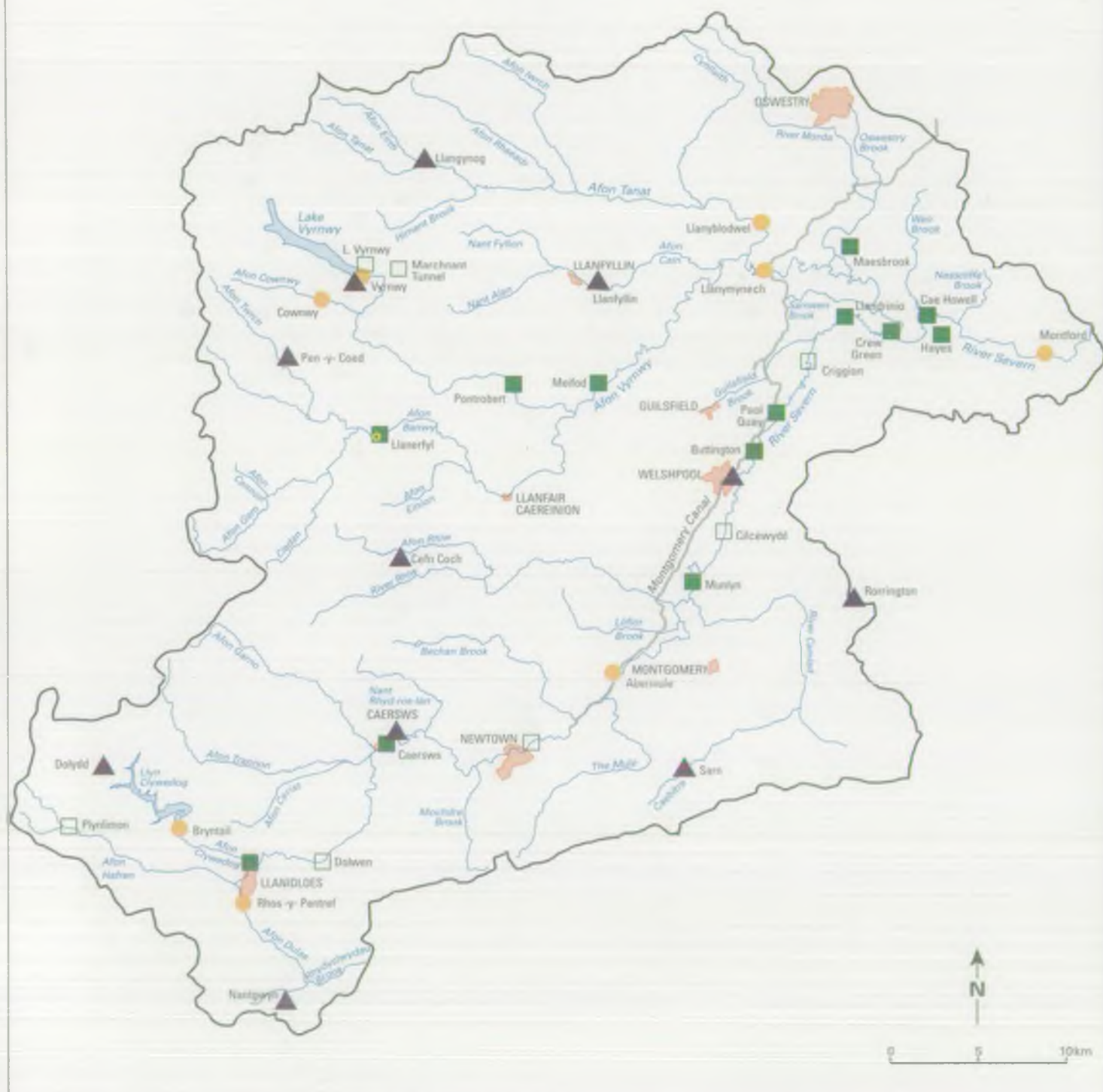
Stocks of juvenile salmon and trout are monitored annually at 10 sites on the Afon Rhiw and Afon Tanat. In addition, a further 148 sites are monitored for all fish species at locations on rivers throughout the catchment as part of the NRA's 3 year rolling strategic survey programme. Salmon redd counts are also carried out annually together with the collection of catch statistics for salmon from anglers' rod licence returns. An electronic fish counter is presently being installed at Llanyblodwel gauging weir on the Afon Tanat, which will be used to monitor runs of salmon up the river. Although not located within the catchment, the Shrewsbury counter is designed to count all fish migrating into it.

Habitat Surveys

As part of a national initiative River Corridor Surveys have been and are being undertaken on the major rivers in the catchment eg Severn, Vyrnwy and Tanat. A survey methodology for river habitats is being tested in 1994 on which a national habitat classification scheme for rivers will be based. Together these will provide an initial means of identifying areas and features requiring protection or enhancement.

Location of River Level, Flow Measurement & Rain Telemetry Stations

Map 2



KEY

- Catchment Boundary
- Canal

- Flow measurement station with Telemetry
- Level measurement station with Telemetry
- Level measurement station no Telemetry
- ▲ Rainfall Telemetry station

2.3 KEY DETAILS

Area 2,065 km²

<u>Population</u> (estimates from 1991 Census)	<u>Year</u>	<u>Population</u>
	1991	74,800
	2001 (predicted)	83,000

<u>Topography</u>		
	Source of Severn	613m (AOD)
	Highest Point	741m (AOD)
	Lowest Point	55m (AOD)

Administrative Details

Percentage of Plan Area

County Councils	Powys County Council	79%
	Shropshire County Council	14.5%
	Clwyd County Council	6%
	Gwynedd County Council)
	Dyfed County Council) < 1%
District Councils	Montgomeryshire District Council	Radnorshire District Council
	Oswestry Borough Council	Meirionnydd District Council
	Shrewsbury & Atcham Borough Council	Glyndwr District Council
	South Shropshire District Council	Ceredigion District Council
National Parks	Snowdonia National Park (< 1%)	
NRA	Severn-Trent Region, Upper Severn Area	
Water Companies	Severn Trent Water	
	North West Water	
	Dwr Cymru/Welsh Water	
Internal Drainage Boards	Melverley IDB	Powysland IDB
British Waterways	Montgomery Canal	

Main Towns and Land Use

Main towns and settlements in the catchment are Oswestry (14,219), Newtown (10,097), Welshpool (5,725), Llanidloes (2,616), Llanfair Caereinion (1,257), Caersws (1,182), Montgomery (1,059), Llanfyllin (1,054) and Guilsfield (1,020).

The main land uses in the catchment are upland pasture/rough grass 33%, arable 17%, grass 12%, woodland 10%.

CATCHMENT OVERVIEW

Water Quality

Length (km) of river and canal in each component of the General Quality Assessment - 1993

General Description	Chemistry Component Grade	Biological Component Grade
GOOD	A 221.3) 343.3	A 389.7
	B 122.0)	
FAIR	C 21.3) 21.3	B 6.1
	D 0)	
POOR	E 5.0) 5.0	C 28.2
BAD	F 0)	D 0
Not Graded (Due to insufficient data)	113.9	59.5

No of Consented Discharges 200

Comprising:- 104 water undertaker sewage and storm overflows, 88 private sewage works, 8 industrial.

Water Resources

Average annual rainfall	1,160mm
Total licensed abstraction	112,397 Megalitres per year
Mean flow of River Severn at Montford	3,660 Megalitres per day
Number of licensed abstractions	351
of which:- Groundwater	239
Surface water	112
Llyn Clywedog	49,924 Megalitres
Lake Vyrnwy	59,666 Megalitres

Flood Defence

Length of Main River in Catchment	277 km
Length of Main River within IDB area	64 km
Length of floodbanks and flood walls maintained by NRA	79 km
No of urban flood alleviation schemes	4
No of operational sluices/pumping stations	2
Max. flood drawdown runoff at Llyn Clywedog	171 mm over catchment to dam
Max. flood drawdown runoff at Lake Vyrnwy	140 mm over catchment to dam

Fisheries

Length of watercourse designated under E C Directive for Freshwater Fisheries (78/659 EEC)

Salmonid	351.1 km
Cyprinid - rivers	0
Cyprinid - canals	40.5 km

Conservation

Sites of Special Scientific Interest	77	(of which 49 have a wetland interest)
Prime Sites	111	(of which 42 have a wetland interest)
Scheduled Ancient Monuments	263	(of which 48 have a close association with the water environment)

SECTION 3.0 ISSUES AND OPTIONS

This section of the plan details specific issues in the Catchment. The issues have been identified by:

- * comparing Targets (Section 5) with the Current State of the Catchment (Section 6)
- * informal consultation with selected organisations in the catchment.
- * considering pollution incidents and flooding complaints.
- * utilising the local knowledge of NRA Staff.

The options as presented are the initial views of the Upper Severn Area, Severn-Trent Region of the NRA and do not constitute policy statements. Comments on the issues and options are requested together with any new ideas/suggestions.

Wherever possible those responsible for carrying out each option have been identified. The options presented are intended to facilitate improvements to the water environment for the benefit of all users. Their implementation will require the co-operation of many organisations and individuals.

3.1 ISSUES IDENTIFIED

Whilst many issues cover all the NRA's functions they have been grouped under four main headings.

Issues 1 - 4 Water Quality

Issues 5 - 14 Water Quantity

Issues 15 - 26 Physical Features (Conservation, Fisheries, Flood Defence)

Issues 27 - 28 Planning Liaison

There is no implied order of priority in these issues.

- Issue 1- Safeguarding high quality water, water resources and habitats
- Issue 2- Acidification
- Issue 3- Achievement of longer-term Water Quality Objectives and Compliance with EC Water Quality Directives.
- Issue 4- Sewage disposal in rural areas
- Issue 5- Stewardship role for abundant surface waters
- Issue 6- River regulation and reservoir control
- Issue 7- Export of water from the catchment
- Issue 8- Future transfers of water using the River Severn
- Issue 9- Reliability of water supplies in meeting peak demands
- Issue 10- Shropshire Groundwater Scheme use and impacts
- Issue 11- Use of River Severn water for Montgomery Canal
- Issue 12- Abstractions from river gravels use and impacts
- Issue 13- Lake Vyrnwy possible future change of use
- Issue 14- Groundwater abstraction licensing exemptions
- Issue 15- Protection of rare and threatened species
- Issue 16- Opportunities for amenity and recreation
- Issue 17- Restoration of damaged habitats
- Issue 18- Obstacles to salmon migration
- Issue 19- Maintenance of native brown trout populations
- Issue 20- Poaching and illegal fishing
- Issue 21- Piscivorous birds
- Issue 22- Erosion and illegal river works
- Issue 23- Water level management in the Severn-Vyrnwy confluence area
- Issue 24- Preservation and definition of flood plain
- Issue 25- Caravan sites in flood plain
- Issue 26- Impacts of land use changes, including hill land improvement and afforestation, on rates of run-off
- Issue 27- Controlling the impact of development on the water environment
- Issue 28- Changes in Local Government structure

3.2 A DESCRIPTION OF THE ISSUES FACING THE CATCHMENT

ISSUE 1 - SAFEGUARDING HIGH QUALITY WATERS, WATER RESOURCES AND HABITATS

The catchment contains the highest proportion of the Region's top grade rivers. Water quality of rivers in the area is generally good (General Quality Assessment Grades A & B) and the rivers support high class fisheries and provide habitats for a wide range of flora and fauna. Moreover, the high quality enables extensive abstraction, particularly for drinking water, to take place further downstream.

To ensure this situation does not deteriorate it is vital that land use changes, whether from increased urbanisation and other pressures for development, tourism, recreation or changing agricultural practices, are effectively controlled.

Continued monitoring, vigilance and control is necessary to maintain the generally high quality of water resources in the catchment. This is achieved through planning policies, application of the NRA's regulatory powers and restoration of damaged environments. In particular, attention is increasingly focussing on identification and restoration of contaminated land, on control of waste disposal activities and on the effects of mineral extraction.

The very high standard of water quality coupled with the reliable and large quantities of winter water make this catchment one of the most environmentally important areas in the country. The proximity of the River Severn to major demand centres for water supply, agriculture, industry and recreation provides a national asset which calls for maximum levels of environmental protection.

The catchment is characterised by having many high quality and unspoilt fishery habitats, most of which are designated salmonid fisheries under EC Directive (78/659/EEC). Further rivers have recently been identified as future candidates for EC designation (see issues table Section 3.3). Salmon, trout and grayling dominate in most watercourses, but cyprinids also occur especially in the River Severn. Much of the physical habitat is in a natural state and fish populations are healthy and largely native in origin. Preservation of these high quality and relatively pristine resources is one of the most important fisheries issues for the NRA to address in the catchment.

The needs of forestry, agriculture, rural and urban development, flood defence and land drainage have placed the water environment under ever increasing threat. The NRA has a statutory duty to protect the conservation value of rivers, river corridors and remaining wetland habitats and will use its regulatory powers to help achieve this.

ISSUE 2 - ACIDIFICATION

Acidification is caused by the deposition, mostly as rain, snow or fog, of sulphur and nitrogen emissions produced from the burning of fossil fuels. Vegetation scavenges these water-borne acidifying chemicals from the atmosphere, with coniferous forest being particularly efficient as an atmospheric pollutant scrubber.

In susceptible areas where there is little or no natural buffering capacity from the soils and bedrock, the acidic rain is not neutralised. It leaches aluminium from the soil and then flows into streams and rivers, which then also become acidic, especially during heavy rainfall or when snow is melting.

The acidity itself may be damaging to aquatic life, but, when combined with high aluminium concentrations, is very toxic to fish and other aquatic animals. The conservation value of affected waters may be lowered due to reductions in variety and numbers of aquatic animals and plants. This will also affect birds and mammals which feed in the rivers, such as dippers and otters.

Acidity and high aluminium concentrations contribute to poor salmon and trout survival, especially of eggs and young fish which spend their early years in the upper vulnerable parts of the catchment most likely to be affected by acidification. In extreme situations rivers have become devoid of fish, for example the upper 5km of the River Severn in the Hafren Forest. In others, such as the Afon Twrch, fish stocks are under serious threat and future problems are anticipated in rivers such as the Afon Gam when recent forestry plantations (early 1980s) reach the closed canopy stage of growth.

Acidification may pose a problem for the abstraction of water for potable use since increased treatment may be required to reduce acidity and increased aluminium and manganese levels. This may also affect hydro-electric power generation, where precipitation of manganese in turbines is a potential problem.

Conifer afforestation has been shown to exacerbate acidification effects in acid sensitive areas. Consequently, it may be necessary to restrict and manage conifer forestry plantations in order to limit the damage. This would need to be developed in consultation with landowners and forestry organisations who wish to utilise their land in this way.

Refer to Sections 4.9, 5.4, 6.4 and Map 12 for additional information.

ISSUE 3- ACHIEVEMENT OF LONGER-TERM WATER QUALITY OBJECTIVES AND COMPLIANCE WITH EC WATER QUALITY DIRECTIVES.

The Water Quality Objectives (WQO) Scheme will establish clear quality targets for each use to which a river stretch may be put. These uses include River Ecosystem; Special Ecosystem; Abstraction for Potable Supply; Agricultural/Industrial Abstraction and Watersports. The first phase is restricted to the River Ecosystem use, quality

standards have been introduced by the Surface Water (River Ecosystem) (classification) Regulations 1994. Table 7 (Section 5.1) describes the river and canal stretches in the CMP area and identifies their longer-term objective class and their objective class to be achieved during this CMP period. Stretches marked with an asterisk (*) identify where maintenance or anticipated improvements for water quality is subject to planned investment.

Improvements are predicted in toxic metal levels in the stretches of the Afon Cerist following completion of a contaminated land reclamation scheme at Fan Lead Mine. Dissolved oxygen levels are expected to increase in the Montgomery Canal as closed stretches of the canal are re-opened during the plan period; this will particularly affect the current land locked stretch near Queens Head.

Increased demands on the treatment capacities of Newtown and Oswestry - Mile Oak sewage treatment works are likely to cause deteriorations from current effluent quality towards the limits of their respective discharge consents. Consequently the CMP objectives have been set to reflect the impact of these potential deteriorations. Additional treatment provision is planned under Severn Trent Water's AMP2 programme at Newtown to ensure compliance with the EC Urban Waste Water Treatment Directive and at Oswestry to ensure the Morda continues to comply with EC Fisheries Directive standards. However, these provisions are unlikely to be sufficient to meet the longer term water quality objectives of the receiving watercourse. The further additional treatment provision to meet these objectives will need to be addressed by AMP3 and future CMPs.

Until WQOs are introduced for the other uses water quality is assessed by compliance with the standards of relevant EC Water Quality Directives. Table 10 (Section 6.1) lists the monitoring points where failure of compliance has been identified, exceedances are not thought to be due to point sources but result from diffuse natural drainage.

Short term deteriorations of Water Quality can result from 'one-off' pollution incidents, many of which are agricultural in origin.

Refer to Sections 4.5, 4.6, 4.7, 4.8, 5.1, 6.1 and Map 20 for additional information.

ISSUE 4 - SEWAGE DISPOSAL IN RURAL AREAS

All towns and many villages in the catchment are served by public sewers and sewage treatment works. Outside the sewered areas, properties are served either by private treatment plants with consented discharges of treated effluent to a watercourse, or by septic tanks with soakaways for effluent disposal. Although these are adequate for the majority of cases several communities have growing pollution problems caused by the concentration of properties, poor ground conditions for soakaways, increased water consumption, and infilling development. In some instances, satisfactory provision of drainage for sites allocated for development in Local Plans will be problematic.

Septic tanks are the most common type of installation. The majority of septic tank problems are caused by blocked or inadequate soakaways, and can usually be attributed

to poor location, poor soakaway design or lack of maintenance. Lack of maintenance is invariably caused by ignorance or negligence on the part of the owner. Particular circumstances which result in inadequate maintenance are joint ownership (where responsibility for maintenance is unclear) and change of ownership, where the new owner is unaware of the maintenance requirements. Owners of septic tanks should know how their tanks work and the maintenance requirements. This would reduce the number of problems caused by ignorance of the maintenance needs, but would not affect problems caused by negligence.

Septic tanks are sometimes installed in unsuitable locations or with poorly designed drains because responsibility for septic tank soakaways is unclear. Soakaways are not covered by the Building Regulations, so building inspectors can neither prevent installation in unsuitable conditions nor ensure proper construction in others. Existing controls include the planning process, building control, public health legislation and the regulatory powers of the NRA to protect surface and groundwater quality. In practice, these deal effectively with identified problem installations but do not address the issues of location or maintenance directly.

Cesspools which are watertight and regularly emptied do not cause problems. Their disadvantage is their high emptying cost, which can lead owners to damage the tank so that sewage escapes.

Small sewage treatment works problems are usually caused by lack of maintenance, although some are caused by poor design of the plant. The problem of lack of maintenance is the same as with septic tanks above but is exacerbated when a substantial development of many units is served by private plant.

Designated settlements where these methods of sewage disposal are currently causing odour, nuisance, health or pollution problems, or where these are considered likely to occur should further development take place, include: Aberhafesp, Ardleen, Cefn Coch, Coedway, Cwmbelan, Dolfor, Forden, Hyssington, Leighton, Llanfihangel, Llanmerewig, Maesbury Marsh, Pontdolgoch, Rhos-y-Brithdir and Sarnau.

Refer to Section 4.5 for additional information.

ISSUE 5 - STEWARDSHIP ROLE FOR ABUNDANT SURFACE WATER

The prolific surface water resources within the catchment confer a responsibility of stewardship far beyond that required for local needs. Conservation of resources needs to take into account requirements for release of water from storages such as Llyn Clywedog and Lake Vyrnwy which serve users in other areas and regions such as north west England, the West Midlands and the Bristol area.

Investment in existing water conservation works relies on continued demand for a high level of control of the upland surface water resources. This arises because of the need to provide augmentation of River Severn flows in the summer and a measure of local flood mitigation during the annual spates of winter. Control of this water must take

account of needs far beyond the catchment, eg. flows to Severn Estuary, because of this wide but dispersed reliance on the water from the catchment.

Maintenance of the infrastructure of the reservoir at Llyn Clywedog relies on the continuation of abstraction charging arrangements which reflect the strategic use of water from the reservoir. Current arrangements for this are organised through a Section 20 Agreement under the Water Resources Act 1991 between Severn Trent Water and the NRA. At Lake Vyrnwy maintenance is substantially dependent upon committed capital expenditure by North West Water Ltd and by Severn Trent Water Ltd. Quality of raw water is sensitive to land use management in the Vyrnwy catchment.

Hydropower developments at low-head sites also need close appraisal to ensure that impacts on other water users upstream and downstream are acceptable.

Refer to Sections 4.3, 4.4, 5.3, 6.3 and Map 7 for additional information.

ISSUE 6 - RIVER REGULATION AND RESERVOIR CONTROL

Control of reservoir storage seeks to optimise the primary function of regulating river flows and water supplies with secondary reservoir functions of flood retention, amenity provision and hydropower generation. Control rules are followed to ensure maximum benefits are obtained for all these functions during a wide range of weather conditions.

Reservoir releases are made throughout the year for a wide variety of purposes. They result in a similarly wide variation in reservoir and river conditions. At any one time of year the weather conditions play a major role in the determination of the correct release from reservoir to river.

Seasonal releases of water result in higher than normal flows in the River Severn during dry summers. Early summer flows in the Vale of Powys, however, are often very low until augmentation releases are started. Amenity use of the river is therefore erratic and unpredictable from year to year.

Impacts can include effects on amenity use of a reservoir when it is well drawn down or spilling. Similarly, effects on use of the river downstream by abstractors are highly dependent on the reservoir release rules in force.

Changes in river flow regime can be expected to continue as the reservoirs are increasingly used to meet new demands for river water further downstream. Effects of these changes on existing users need to be taken into account.

Refer to Sections 4.3, 5.3, 6.3 and Map 7 for additional information.

ISSUE 7 - EXPORT OF WATER FROM THE CATCHMENT

Over 200 Megalitres per day (Ml/d) of water is exported out of the catchment from Lake Vyrnwy for use mainly in north west England. This water is not available for re-use in the Severn catchment. All water from Llyn Clywedog, on the other hand, enters the River Severn for use within the Severn basin and in neighbouring parts of the Trent basin and the Bristol area.

The export of water to north west England has existed for over a hundred years since the Vyrnwy scheme was commissioned in 1892 initially to serve the needs of the city of Liverpool. Some water is also released from Lake Vyrnwy to augment River Severn flows in summer, but only in a supplementary capacity to the main flow augmentation releases from Llyn Clywedog.

Releases to augment River Severn flows are made from a water bank which is a form of water credit agreed in the late 1970's between the predecessors of North West Water and the NRA. It is actually a way to save monthly compensation releases until they are needed in the river. Lake Vyrnwy also spills large volumes of water over the dam crest virtually every winter.

Refer to Sections 4.3, 5.3, 6.3 and Map 7 for additional information.

ISSUE 8 - FUTURE TRANSFERS OF WATER USING THE RIVER SEVERN

The River Severn is well placed to provide water throughout the year for other NRA regions -notably Thames, Anglian and South Western. Most of the water to service these future needs via this route arises naturally in the Upper Severn catchment.

Winter surface water resources in particular are plentiful. Increases in the use of River Severn water for other regions can therefore be achieved during winter periods without any significant effect on the rivers within the catchment. Potential extra abstractions from the River Severn to serve these neighbouring regions would occur downstream of the Perry confluence ie. outside the scope of this plan.

In dry summers any extra releases to support other regions would significantly raise river flows in the Severn and Vyrnwy. These higher flows could come from existing or enlarged reservoirs in the uplands of the catchment, or even from imported water from external sources. Detailed investigation of the environmental impact of further changes to the flow regime in the River Severn would be carried out before any decision was taken. However, the need for strategic developments of any significance is unlikely well into the next century. This is considered more fully in the NRA's National Water Resources Development Strategy.

Refer to Sections 4.3, 5.3, 6.3 and Map 7 for additional information.

ISSUE 9 - RELIABILITY OF WATER SUPPLIES IN MEETING PEAK DEMANDS

Due to the limited groundwater resources in most of the catchment area, upland streams dry up rapidly during summer dry spells. Agricultural users in particular are therefore more dependent than might be expected on piped water supplies for livestock watering. This places high peak demands on water supplies across an extensive distribution system.

The unreliable nature of many upland streams creates significant differences in the availability of surface water resources during dry summers. Augmented flows in the Rivers Severn and Vyrnwy are in stark contrast to the desiccated rocky stream beds in the hills. In addition, some larger unregulated gravel rivers such as Afon Rhiw and Afon Banwy appear to lose all their visible flows in some reaches.

Livestock watering becomes critical and relies either on local subsurface sources which may also be unreliable if shallow, or on tankering from flowing rivers or canals in the lowlands or in uplands peat-hags.

The unreliability of surface watercourses (excepting the Rivers Severn and Vyrnwy) encourages private water supplies to rely on local shallow superficial deposits supplemented by mains water. High peak demands are therefore needed from the water supply system, which test the infrastructure.

Refer to Sections 4.2, 5.3 and 6.3 for additional information.

ISSUE 10 - SHROPSHIRE GROUNDWATER SCHEME USE AND IMPACTS

The small area of sandstone aquifer in the north east of the catchment is partly used to regulate River Severn flows as a supplementary source to Clywedog and Vyrnwy reservoirs. Five of the boreholes of the Shropshire Groundwater Scheme fall within the catchment and a further four lie just outside the catchment boundary. The boreholes are pumped in dry summers to augment flows in the River Severn. Maximum discharge at the Forton outfall is 45 Ml/d.

Direct impact on watercourses in the catchment is minimal because the outfall pipeline discharges to the River Severn only 0.5km upstream of the catchment outlet. Operation of the scheme is monitored to ensure impacts on the other sources, surface water, soil moisture and wetlands are acceptable. Groundwater levels will be temporarily lowered during operational pumping but should recover following a winter of average recharge.

Refer to Section 4.3 and Map 5 for additional information.

ISSUE 11 - USE OF RIVER SEVERN WATER FOR MONTGOMERY CANAL

As restoration proceeds the canal will require increasing amounts of water for navigation and maintenance of the associated 17 nature reserves. Most of this water comes from the River Severn at Penarth and the River Tanat at Carreghofa. As Frankton Locks are restored, River Dee water will enter the canal. This water is derived from the Llantysilio horseshoe falls abstraction upstream of Llangollen. This water will discharge to the River Perry or the River Morda until restoration is completed through to Llanymynech.

During hot dry summer weather it is important to recognise that the canal acts as a sink for river water which does not all return to the river. Adequate monitoring of flows into and out of the canal is necessary. Increasing loss of water from the River Severn is particularly important during dry summer weather. It is at this time that the River Severn flow is augmented by reservoir releases from Llyn Clywedog, which are intended to benefit all legitimate river users downstream to Gloucester and Bristol. Any losses from the River Severn may have to be made up by pumping from the Shropshire Groundwater Scheme into the River Severn in years when Llyn Clywedog cannot release enough water to maintain Severn flows throughout the summer.

Refer to Sections 4.3, 4.11 and 4.13 for additional information.

ISSUE 12 - ABSTRACTION FROM RIVER GRAVELS USE AND IMPACTS

Local public and private water supplies are drawn from river gravels and other superficial deposits in the main valleys of Powys and Vyrnwy. This water is drawn from strata below and alongside the river bed. The strata are recharged by rainfall on a seasonal basis and by induced infiltration through the bed of the river which occurs all the year round. These abstractions, as do all groundwater abstractions, need to be carefully monitored to ensure that demands do not exceed the reliable long term yield of the gravels.

The very limited extent of groundwater in the catchment puts an upper limit on groundwater fed development that can take place without unacceptable environmental impacts. This means that any substantial new development would require provision of surface water resources.

Abstraction from shallow groundwater can be unreliable depending on the extent of the aquifer. River gravels associated with perennial rivers are very reliable since they receive regular recharge by the river for most of the year. Much of this recharge occurs when the river spreads out over its wide flood plain in the Vale of Powys - this normally occurs several times each winter. In summer the gravel aquifer may provide baseflow back to the river.

Any overdevelopment of the limited shallow groundwater resources in the catchment is to be avoided. It could result in environmental damage and possible irreversible loss of wetland habitats. Potential ground subsidence impacts are alleged to have occurred following recent test pumping at Fron near Abermule.

Refer to Sections 4.2, 5.3, 6.3 and Map 5 for additional information.

ISSUE 13 - LAKE VYRNWY POSSIBLE FUTURE CHANGE OF USE

Proposals to increase the volume of water released from Lake Vyrnwy to augment River Severn flows have effects in north west England, and in the Afon Vyrnwy, both in summer and in winter.

To enable additional releases of water from Lake Vyrnwy to support River Severn flows, some reduction in the quantity taken by North West Water Ltd for water supply purposes would be required. Any reduction in supplies from Vyrnwy to North West Water would require either conjunctive use with other sources in the North West supply area or direct substitution of supplies. Modelling studies have shown that there is some scope for providing additional releases without major detriment to the water supply function and which will achieve a significant increase in flow benefit to the River Severn.

Extra releases to the Afon Vyrnwy will decrease the duration of very low flows in this river. This will increase the duration of moderate river widths in those reaches which currently exhibit tracts of gravel bed during summer low flows. There will also be a change in the seasonal drawdown pattern at the Lake which can affect users of the reservoir itself as well as the discharge arrangements from the dam.

Refer to Section 4.3 for additional information.

ISSUE 14 - GROUNDWATER ABSTRACTION LICENSING EXEMPTIONS

A large part of the catchment is exempt from licensing for abstraction from groundwater. (See Map 5) This exemption stems from the Severn River Authority (Exceptions from Control) Order 1967 established under the Water Resources Act 1963. One of the main reasons for the exemption of these areas arises from the difficulties in assessing the available resources in a particular area.

The exemption covers the large area of relatively impervious rocks in the Marches, where very limited quantities of groundwater are found. However, the catchment does contain numerous small wells and boreholes providing supplies to multiple private properties. Many of these are consumptive ie. do not return all water to the catchment. Examples include the bottling of water and spray irrigation. In this context there is concern in case the current diversification of farming should result in exploitation of, rather than the traditional good husbandry of, water resources.

The exemption removes the normal protection against derogation provided to existing abstractors under the Water Resources Act 1991. Any new borehole proposals, which typically would require a licence, therefore can only be screened for their effect on neighbouring wells via Common Law. For example, conditions may be needed on a

planning permission requiring a test pumping, rather than via an NRA-backed consent under Section 32 of the Water Resources Act 1991.

Removal of the exempt area could have widespread implications for derogation of water supplies if shallow groundwater has been overdeveloped.

Refer to Sections 4.2, 5.3, 6.3 and Map 5 for additional information.

ISSUE 15 - PROTECTION OF RARE AND THREATENED SPECIES

Otters

Otters are a protected species under the Wildlife and Countryside Act 1981. The Upper Severn catchment is a national stronghold for otters and a resource from which future expansion to other parts of the country will take place. The habitat requirements of otters include undisturbed areas of river plus bankside tree and shrub cover. The preservation of existing high quality habitats is vital for the protection of otters and for any future recolonisation of their former range. Conservation bodies are also concerned about the disturbance of otters by mink hunting. Mink have spread into the upper reaches of both the Severn and Vyrnwy in recent years and this has been followed by the use of hounds to hunt them.

Crayfish

The native British crayfish is a protected species under the Wildlife and Countryside Act 1981. Crayfish populations are under serious threat of extinction on a local, regional and national scale. The threat arises principally from the farming of non-native signal crayfish that carry a disease, "crayfish plague", which is invariably fatal to the native species. Once the disease gets into a watercourse the entire population of native crayfish within that river system are often eradicated. Within the catchment, this is known to have occurred in the River Camlad. Controls on the introduction of signal crayfish are exercised by MAFF.

Floating Water-Plantain

Floating water-plantain is to become a protected species under the EC Habitats Directive. Its stronghold in Britain is the catchment of the upper reaches of the River Severn, including the Montgomery Canal.

Refer to Sections 4.13, 5.4 and 6.4 for additional information.

ISSUE 16 - OPPORTUNITIES FOR AMENITY AND RECREATION

Montgomery Canal

The proposed restoration of navigation on the Montgomery Canal is likely to result in the loss of one of the most botanically rich lengths of canal in the country. 17

ISSUES AND OPTIONS

compensatory nature reserves to mitigate this loss have been agreed by British Waterways, Countryside Council for Wales and English Nature at various sites along the canal. General recreational use of the canal will increase considerably, as will local business opportunities. Economic benefits derived from these activities will help to ensure maintenance of the canal and the reserves to a high standard.

Increased boat traffic will impact on the existing high quality fishery, with a likely decline in the existing roach, tench and bream populations. These may be replaced by other species, such as gudgeon, with numbers of fish possibly increasing but with a lower biomass. Extra lengths of canal will be opened up which will provide some new fishing facilities.

Navigation

A public right of free navigation exists on the River Severn downstream of Pool Quay. This right is currently exercised mostly by canoeists, but access problems occur and the NRA has received requests to construct suitable launching facilities. No right of navigation exists upstream of Pool Quay, where use of the river for boating is dependent on riparian owner permissions.

Jet Skiing

There are growing pressures from jet ski and windsurfing enthusiasts to use areas of open water within the catchment. A lack of facilities for jet skiers and the consequent unauthorised use of some waters, including nature reserves, has given rise to conflicts.

Footpaths

There are few definitive riverside footpaths in the catchment, thus limiting the potential for public enjoyment of rivers. Scope therefore exists for collaborative developments with owners, local authorities and other bodies to increase access opportunities. Any recreational developments need to be considered carefully in relation to the need to safeguard high quality habitats (see Issue 1).

Refer to Sections 4.15 and 4.16 and Map 19 for additional information.

ISSUE 17 - RESTORATION OF DAMAGED HABITATS

Rivers

Although many fishery and aquatic habitats in the catchment are of very high quality, some rivers have been damaged by previous engineering works. In particular the Afon Trannon/Cerist was badly affected by a land drainage scheme in the late 1970s. The lower reaches of the river remain canalised, supporting very few fish, and a legacy of frequent maintenance works further upstream hinders its recovery to a stable and diverse environment. Investigations will be required to determine if engineering practices can be modified to meet flood defence, conservation and fisheries requirements. Salmon.

spawning grounds have also deteriorated on some rivers through compaction and changes in size composition of the gravels. The reasons for this are presently unclear, although land use changes are a likely contributory factor.

The lower reaches of the River Morda are an impoverished habitat for fish and other wildlife. The river is maintained in a relatively canalised state with very few riparian or instream features, but has considerable potential for improvement.

Improvements to damaged watercourses can only be achieved with the permission and co-operation of the riparian landowners. Some incentives may be needed to encourage this process, such as the Tir Cymen/Countryside Stewardship schemes which have been used elsewhere in the country.

Tree Cover

Early pioneer tree clearance during the 1930s and 40s along the heavily grazed lower reaches of this area has resulted in significant lengths of river being devoid of tree and scrub cover. Additionally, the majority of watercourses lined with mature and semi-mature trees suffer from undergrazing, thus preventing natural succession. Unless action is undertaken, reduction of tree and scrub cover will continue, adversely affecting the ecology of the river system.

Wetlands

There has been a marked decline in wetland habitats within the catchment over the last decade which in turn has impacted on various birds, primarily wading species such as lapwing, snipe, curlew and redshank. The numbers of lapwing, both here and in other parts of the country, have dropped so much that it is likely to be notified as Red Data book species. The possibility of remedial action at suitable sites should be investigated. Also refer to Issue 23.

In consultation with conservation bodies, the NRA is examining existing and potential wetlands along the River Severn, with the aim of developing a collaborative Severn Valley wetlands strategy.

Invasive Plants

Invasive weeds such as Japanese Knotweed, Giant Hogweed and Himalayan Balsam are becoming increasingly common in the catchment, posing an increasing threat to native flora by dominating riparian habitats. Measures are required to prevent further spreading and to reduce the current distribution of these alien species.

Refer to Sections 4.11, 4.13, 5.4 and 6.4 for additional information.

ISSUE 18 - OBSTACLES TO SALMON MIGRATION

Many kilometres of potentially high quality spawning and nursery rivers are presently inaccessible to salmon because of obstacles, both natural and man-made.

The upper 10km of the River Severn is blocked off to salmon by a weir at Felindre, and many of the tributary streams also have impassable weirs such as those on the Mule. Natural barriers occur at Dolanog Falls on the River Vyrnwy and Tylwch Rocks on the Afon Dulas. Opening up of such areas to salmon by the removal of weirs or the construction of fish passes can make a significant contribution to enhancing salmon runs in the River Severn. An example is the salmon pass at Carreghofa Weir on the River Tanat, constructed in 1976 and improved in 1984, which allowed access to what is now one of the most important salmon spawning areas in the whole of the Severn catchment.

Where a pass or weir removal is not viable or environmentally acceptable, adult salmon can be physically placed above an obstacle to spawn or the upstream area can be stocked with hatchery-reared salmon fry to make use of the potential rearing capacity of the river.

The NRA is likely to be faced with a shortfall in Grant in Aid (GIA) funding for salmon work in the future. Alternative sources of funding may therefore need to be sought if the above improvements are to be realised.

Refer to Sections 4.11, 5.4, 6.4 and Map 25 for additional information.

ISSUE 19 - MAINTENANCE OF NATIVE BROWN TROUT POPULATIONS

Native brown trout populations are a nationally threatened resource. Many of the rivers in the Upper Severn catchment still contain thriving stocks of these fish, particularly in the upper reaches of watercourses and in the smaller tributary streams such as the Afon Dulas, the Mule, Afon Garno and River Camlad.

The genetic integrity of native trout stocks has been diluted in other rivers such as the Tanat and Severn by introductions of hatchery-reared trout of diverse origin, and numbers of wild fish have declined in some instances. Rainbow trout have also been introduced into the Tanat and Severn, and are known to breed in small numbers in the feeder streams of Llyn Clywedog and Lake Vyrnwy following many years of stocking in those waters. To protect the native brown trout populations it may be necessary to prohibit stocking in rivers where this does not currently take place and restrict stocking in other rivers to brown trout only, preferably of local origin and of a size comparable to the wild fish.

The high quality habitats that are required to support brown trout will also need protection through the application of the NRA's regulatory powers, and decline of wild brown trout stocks in some rivers, such as the River Vyrnwy, will require investigation and remedial action where appropriate.

Refer to Sections 4.11, 4.12, 5.4, 6.4 and Map 26 for additional information.

ISSUE 20 - POACHING AND ILLEGAL FISHING

As with most salmon areas, poaching is an ever present problem. The main type of poaching in the catchment remains the 'traditional' type of taking fish from the spawning grounds at night with gaffs and torches. Some netting and gaffing also occurs at weirs and at other obstructions to migration. So far, however, there has been little evidence of the serious gang type poaching with the use of nets which is common on the nearby River Wye. Poaching of salmon from the spawning areas can have a significant impact on stocks if it is allowed to go unchecked, so high levels of resources are deployed by the Fisheries Section in protecting vulnerable areas at the appropriate time of year.

Problems also occur with anglers fishing for salmon out of season under the guise of legitimately fishing for other species. This is of particular concern in October and November in the salmon spawning areas, most notably on the River Severn from Llanidloes to Newtown and on the lower reaches of the River Tanat. Changes in byelaws may be needed to combat this illegal fishing.

Refer to Sections 5.4 and 6.4 for additional information.

ISSUE 21 - PISCIVOROUS BIRDS

An increase of fish eating birds in the catchment, most notably cormorants and goosanders, has caused concern amongst anglers and brought pressures for culling. MAFF have recently issued some licences for this purpose on the nearby River Wye. A clear, scientifically based case showing significant economic damage to fisheries and the failure of other control methods is needed before consideration should be given for such action in the catchment.

Refer to Sections 4.13 and 6.4

ISSUE 22 EROSION AND ILLEGAL RIVER WORKS

Significant damage has been caused to aquatic life in recent years by localised river works of an unauthorised nature, including the removal of gravels for building works and the alteration of river courses to combat erosion problems.

The catchment has a considerable proportion of medium gradient rivers and watercourses flowing through alluvial soils in flat bottomed valleys. Under these conditions rivers erode and deposit at considerable rates, creating meanders and oxbows in what is often the more productive farmland.

ISSUES AND OPTIONS

On the scale of human lifetimes and land ownership, substantial land losses can be incurred through the effects of erosion. The process of deposition and rebuilding of land to useable agricultural quality is a much more gradual process.

Threatened by such losses the landowner naturally wishes to protect his land. The availability and cheapness of suitable machinery for restoring the river to its former course, cutting off meanders, and tipping of demolition materials has given rise to a number of instances of unauthorised works.

Although at first these works would not appear to affect anyone other than the immediate landowner, this is not the case. Preventing erosion in one place will often exacerbate it in another. Cutting off a meander will increase the gradient, setting off erosion downstream and sometimes upstream.

Most of the spawning grounds and nursery areas that support salmon runs in the River Severn are located in this catchment. Atlantic salmon populations are generally considered to be in decline and under threat throughout their natural range and protection of spawning areas is therefore of vital concern. The activities referred to above have caused significant damage to salmon spawning grounds in recent years, most notably on the River Severn at Llandinam, Penstrowedd and Trehelig. Legal action has been taken by the NRA against a landowner in one instance for the destruction of fisheries habitat.

The effect of straightening, tipping, infilling of old meanders and the removal of river and bankside gravels has damaging implications for many waterside birds such as sandmartins, kingfishers and little ringed plovers as well as for fish and other aquatic life. Some of the sites of river movement are nationally important to the science of geomorphology.

Controls on these activities are exercised through the Water Resources Act 1991 and NRA Byelaws for statutory Main Rivers only, the Salmon and Freshwater Fisheries Act 1975, Planning controls - in some cases, and Waste Disposal Regulations in a limited number. The controls on ordinary watercourses (i.e. non-Main River) are very limited.

At issue is to what extent these activities should be controlled, the method of control, and at whose expense.

Refer to Sections 4.13, 5.4 and 6.4 for additional information.

ISSUE 23 - WATER LEVEL MANAGEMENT IN THE SEVERN-VYRNWY CONFLUENCE AREA

The area surrounding the confluence of the rivers Severn and Vyrnwy forms a low lying plain extending to some 70 square kilometres. It is prone to frequent flooding, although a substantial proportion is protected by low level embankments called argaes. These argaes provide protection against flooding to agricultural land, roads and property to approximately the 5 to 10 year return period level.

For more severe floods, the argaes are designed to be overtopped and the water flows into storage in the area previously protected. This system of overtopped banks has the effect of limiting the peak flows downstream. Once the peak flood flow has passed and the rivers are falling a series of flap valves open automatically and sluices are opened allowing the "trapped" water to discharge from behind the argaes back into the river system.

Maintaining the existing degree of protection is important for agriculture and people living within the areas at risk, but there is no scope for improving the degree of protection without substantial adverse consequences either locally or elsewhere. The flooding regime gives rise to very large expanses of standing flood water several times a year, sometimes for periods of 3 to 4 weeks.

The hollows and ponds, rough tussocky pasture, hedgerows and trees, riverside trees and shrubs, together with the effects of seasonal flooding, provide a mosaic of habitats in the Severn/Vyrnwy confluence area. The area is one of the major flood plain environments within the catchment and is of national importance for wading birds and overwintering wildfowl. Archaeological features also add to the overall importance of the area for conservation.

The gradual loss of this range of habitats through changing agricultural practice and improved drainage is having a detrimental impact on this environment. In consultation with conservation bodies the NRA is currently reviewing environmental works in this area, with the aim of developing a strategic plan to enhance wildlife, particularly breeding wading birds and overwintering wildfowl.

Refer to Sections 4.13, 4.14, 5.4 and 6.4 for additional information.

ISSUE 24 - PRESERVATION AND DEFINITION OF FLOOD PLAIN

The catchment is predominantly hilly with a scarcity of low altitude land which is at gradients suitable for development. A large proportion of the low altitude land that does exist is in the valley bottoms and within flood plains. As a result there are pressures to allow for development in the flood plain.

The inappropriate development or use of flood plain will:

- create flood risks to the developments themselves necessitating otherwise avoidable expenditure on their control.
- increase flood risks elsewhere by:
 - a) restricting flood plain flows.

ISSUES AND OPTIONS

- b) reducing the flood plain storage effect on flows passing downstream.

the effects are cumulative - particularly b) - making it impossible to set any "limits" which over a period of time will not negate the objectives of any flood plain preservation policy.

The NRA, as a statutory consultee of the Planning Authorities, seeks to prevent development encroaching into the flood plain to avoid any increase in flood risk to people and property. What may start off as only an innocuous proposal can rapidly snowball into a totally inappropriate use of flood plain. An airport is a prime example. What starts off as a grass landing strip then needs aircraft hangers, fuel storage, tarmacadam runway, offices, passenger facilities, more aircraft hangers, security fencing etc.. Even sportsfields generate the need for changing rooms, toilets, social facilities, grandstands etc..

At issue is the conflict between pressure for development in the flood plain (whether it arises from housing, commercial/industrial or roads), against the costs to present and future generations of doing so.

Flood plain areas are also important for nature conservation interests, and have the potential to be greatly improved with suitable management.

Although some lengths of the major rivers (notably the Severn and Vyrnwy) do have definitive flood plain, the extent of the definitive (1 in 100 year return period) flood plain is not mapped for all major watercourses in the catchment.

Flooding in certain areas is well documented and information is gathered during and after flood events by both NRA and Local Authorities. In order to control the flood plain effectively, it is necessary to have an accurate definition of its extent. Where actual flood information is not available computer models can be used to calculate flood levels. This is both costly and time consuming and resources need to be allocated on a priority basis.

Department of Environment Circular 30/92 (Welsh Office Circular 68/92) required that a major input into development plans should be surveys of flooding problems and flood plain (under Section 105(2) Water Resources Act 1991). A Memorandum of Understanding with Local Authorities regarding the programming of the surveys was signed on 31st March 1994. However, problems are likely to arise where, for example, pressure is placed on District Councils to include these surveys in Local Plans without regard to the programme in the Memorandum.

Refer to Sections 4.1, 4.10, 5.4 and 6.4 for additional information.

ISSUE 25 - CARAVAN SITES IN FLOOD PLAIN

Tourism is a major activity in the Welsh part of the catchment. The provision of caravan sites, both touring and static, contributes significantly to this activity with

ISSUES AND OPTIONS

riverside sites seen as an idyllic setting. Caravan sites in flood risk areas create two main problems:

1. The risk of damage to the caravans, and even life, by flooding.
2. Experience shows an inevitable development progression from touring caravans to static caravans to mobile homes to permanent residential development.

Although the main season of use of caravans is the summer months when flood risks are lowest it must be remembered that summer storms in hilly areas have produced some major floods, notably 1886, 1973, with disastrous consequences. Such floods can happen very quickly and cannot be adequately catered for with flood warning systems. Riverside flood plain sites are very attractive and they provide the most obvious flat land in an area where it is in very short supply.

At issue is the conflict between the needs of tourism and the risks to tourists and to other users reliant on the flood plain.

Refer to Sections 4.10, 4.15 and Map 18 for additional information.

ISSUE 26 - IMPACT OF LAND USE CHANGES, INCLUDING HILL LAND IMPROVEMENT AND AFFORESTATION, ON RATES OF RUN-OFF.

When land use changes occur on sufficiently large scale within a catchment, they have an impact on run-off from rainfall reaching the watercourse. There is incomplete evidence that the extensive afforestation and hill land improvement that has taken place over the last 50 years in this catchment has been on a large enough scale to produce changes in the response of the catchment to rainfall. The effects are various, with impacts on both low river flows and on flooding risk.

Initially the drainage required for afforestation can increase the magnitude and swiftness of response but as the forest matures the opposite effect will be manifest. Felling and replanting will set back any reduction in run-off and slow down of response. Afforestation also poses a threat to remaining areas of unimproved or semi-improved land including blanket bogs, wet flushes, small pools and other wetland habitats.

Hill land improvement with the replacement of water retaining blanket bog, rough pasture, and moorland with relatively smooth surfaced grassland, often with underdrainage, will increase the rate of run-off, giving faster rising river levels and higher peak flood flows and levels.

Quantitative data on the scale of land use changes over the last 50 years is incomplete - particularly as regards hill land improvement. Although some research into the effects of afforestation on run-off has been carried out, little has been done on the effects of hill land improvement.

Urban development increases the impermeable area in a catchment and increases the rate of run-off and peak levels. However, urban development in this catchment is unlikely to be on a sufficient scale to have anything other than very localised impacts.

Increased rates of run-off will also impact adversely on erosion rates, giving a knock on effect on other issues.

Issues arising from these effects:-

- Are controls or limits needed on the extent of the above land use changes? - in particular in the reservoir catchments of Llyn Clywedog and Lake Vyrnwy.
- What should those limits be if they are needed?
- Are there underlying limits anyway - there must be a limit to the amount of hill land that can be improved dictated by altitude, slope and existing unimproved hill land area.
- How could any limits be implemented?

This issue is closely linked to the more general issue (No 27) on development.

ISSUE 27 - CONTROLLING THE IMPACT OF DEVELOPMENT ON THE WATER ENVIRONMENT

This is a broad-based but important issue, which cross references with other issues (1, 4, 24, 26 in particular).

The broad objective of catchment management planning is to conserve and enhance the total river environment through effective land and resource management. However, while the NRA is well placed to influence some of the factors responsible for the functioning of the hydrological system, particularly in relation to the river corridor itself, it has very little control over the mechanisms which determine land use change on a catchment-wide basis. This is largely the responsibility of local planning authorities through the implementation of the Town and Country Planning Acts.

NRA planning liaison work involves commenting on individual planning applications and Local Plans.

As a statutory consultee, the NRA is consulted on applications which are in the vicinity of a watercourse, produce waste, or increase run-off (in accordance with the 1988 General Development Order Article 18, and Department of Environment Circular 30/92/Welsh Office Circular 68/92). The positive uptake by local planning authorities of conditions, objections etc. requested by the NRA is an important way of ensuring protection of the water environment.

ISSUES AND OPTIONS

The policies in statutory development plans are very important in that they set out the framework for land use change, and, since the enactment of the Planning and Compensation Act 1991, provide the key reference in determining development applications (Section 54A). It is therefore essential that policies in development plans (Structure Plans, Local Plans, Mineral Plans, Waste Plans and Development Briefs) should address issues related to the water environment. Where site allocations are made, these should not conflict with the protection of the water environment.

The NRA Severn-Trent Region developed "Model Policies for use in Development Plans" during 1991, and published them in July 1992. These were superseded at the beginning of 1994 by the National document "Guidance Notes for Local Planning Authorities on the Methods of Protecting the Water Environment through Development Plans". The NRA, through consultations with Planning Authorities, seeks the inclusion of appropriate policies and site allocations.

The NRA is also a statutory consultee for Waste Regulation Authorities, and is consulted on waste disposal site licence applications and Waste Plans. In addition to our role as a statutory consultee, we are also consulted by a number of other organisations such as the Forestry Authority.

Refer to Section 4.1 and Appendix 2 for additional information.

ISSUE 28 - CHANGES IN LOCAL GOVERNMENT STRUCTURE

The Local Government Review is currently underway, with proposals for Wales already published, and consultations proceeding for Shropshire. The Councils that emerge may be responsible for the complete range of Local Authority services in their area, rather than the existing split of functions between County and District Council level.

The removal of existing arrangements for formal planning consultations and possible loss of appropriate contact officers will have an impact on the planning liaison process.

For example, there are likely to be initial liaison route difficulties with the incorporation of Montgomeryshire into Powys. Additionally, varying emphasis on the water environment in Local Plans will cause problems. Many existing Development Plan policies, both in Structure Plan and Local Plan format, may be applicable for different parts of the same Council area.

These impacts are bound to have a short term detrimental effect on the NRA's ability to influence the Planning process.

3.3 A SUMMARY OF THE ISSUES, AND OPTIONS FOR ACTION

The issues and options facing the catchment, described in the previous section, are shown in summary tables in the following pages. These are intended to provide quick reference to the issues and options that need to be addressed.

Wherever possible the body responsible for carrying out each option has been identified. In some cases this is identified as an individual(s) or an organisation other than the NRA. However, the options as presented are intended to facilitate improvements to the water environment for the benefit of all users. Their implementation will entail many bodies and individuals co-operating. Cost, both capital and revenue, could be regarded as a disadvantage to most of the issues. The Final Plan will provide more detailed budget and timetable implications.

This should not be taken as a definitive list of issues, nor should the proposed options be taken to be the only ones available. We hope that interested parties will debate these issues and pass their comments to the NRA for consideration when preparing the final version of the plan.

ISSUES AND OPTIONS

ISSUE No: 1	Safeguarding high quality water, water resources and habitats		
OPTION/ACTIONS	Responsibility	Benefits	Constraints
1. Maintain water quality to meet EC Directive Standards.	NRA	Maintenance of existing fish populations. Protect water resource uses in other areas.	
2. Seek EC fisheries designations on Rivers Trannon, Cain, Clywedog, Rhiw, Dulas, Eirth and Rhaeadr.	NRA	Improved level of protection for existing fish stocks.	
3. Apply Policy and Practice for the Protection of Groundwater 1992.	NRA Local Planning Authorities (LPAs)	Safe disposal and use of potential pollutants in sensitive areas.	Implementation requires careful investigations.
4. Restore contaminated land.	NRA LPAs Waste Regulation Authorities	Reduction of leaching of heavy metals to watercourses.	Lack of a universal, published database of contaminated land.
5. Seek recognition of extent of ground-water sources both inside and outside the surface water catchment affected by agricultural and industrial practices, and domestic waste disposal.	NRA LPAs Environmental interests	Increased perception of need to safeguard the mostly high quality water resources in the catchment.	Limited published data on quality of groundwater sources.
6. Protect water resources, water quality and aquatic habitats through the planning liaison process and by application of NRA's regulatory powers.	NRA LPAs	Improved awareness of LPAs in taking account of water resources and quality in approving development. Prevention of further degradation of flora and fauna.	Time constraints encourage adoption of "broad brush" policies at Regional or Planning Policy Guidance level. Limitation on development in catchment.

ISSUES AND OPTIONS

ISSUE No: 2	Acidification		
OPTIONS/ACTIONS	Responsibility	Benefits	Constraints
<ol style="list-style-type: none"> 1. Seek long term solution by controlling/ reducing sulphur emissions. 2. Develop National NRA forestry strategy. 3. Control and manage future and existing coniferous forests by application of above strategy. 4. Monitor impacts of acidification on water quality, fish populations and aquatic fauna. 5. Investigate buffer/ riparian zones to mitigate acidifying impacts of afforestation. 6. Investigate in- stream liming techniques for pH & total hardness adjustment and control. 	Government/ Power Generators	Improved water & biological quality & fishery.	Political.
	NRA	Reduced impacts of forestry on water environment.	
	NRA Forestry Authority Local Authorities Countryside Council for Wales (CCW) Forest Enterprise Private Forest Companies Landowners	Maintenance of present water quality.	Limitation to Forestry Development.
	NRA CCW Royal Society for the Protection of Birds (RSPB)	Quantification of changes in water quality, fish stocks, aquatic fauna.	Resources/ Funding.
	NRA	Maintenance of and/or improvement of existing water quality.	Adverse effects on terrestrial ecosystems.
	NRA	Short term expedient to improve water, biological and fishery quality.	Resources/ Funding.

ISSUES AND OPTIONS

ISSUE No: 3	Achievement of Longer Term Water Quality Objectives and Compliance with EC Water Quality Directives		
OPTIONS/ACTIONS	Responsibility	Benefits	Constraints
1. Complete Land Reclamation Scheme at Fan Lead Mine.	Powys CC Welsh Development Agency.	Reduce toxic metal levels in Afon Cerist.	Competing priorities for finite funding under AMP2.
2. Reopen Lower Frankton - Plas Cerrig section of Montgomery Canal.	British Waterways (BW) Canal Restoration Trust (CRT)	Improve Dissolved Oxygen levels by increased flow.	
3. Ensure investment at Newtown and Oswestry - Mile Oak Sewage Treatment Works under AMP 2 Programme.	Severn Trent Water Ltd NRA	Maintain mid-term objective class. Compliance with EC Directives.	
4. Investigate cases of class deterioration of Afon Vyrnwy - Lower reaches.	NRA	Identify cause(s) to prepare Action Plan for next CMP period.	Large number of sites.
5. Assess potential for pollution prevention measures at Abandoned Metalliferous Mining Sites.	NRA	Reduce toxic metal levels.	
6. Support actions of Issue No 2 Acidification.	NRA	Prevent further breaches of EC Directive (pH compliance).	Requires widespread co-operation.

ISSUES AND OPTIONS

ISSUE No: 4	Sewage Disposal in Rural Areas		
OPTIONS/ACTIONS	Responsibility	Benefits	Constraints
1. Further identify impact of inadequate rural sewerage and sewage treatment facilities in catchment.	NRA Severn Trent Water Private STW Operators Local Authorities (Environmental Health Dept)	Knowledge of extent of problem.	Requires co-operation of many organisations.
2. Include policies in structure and Local Plans to prevent further problems in critical locations.	Local Authorities NRA	Existing problem locations do not become worse.	Not a long term solution.
3. Identify methods of funding provision for new public sewerage and sewage treatment facilities.	NRA DoE Severn Trent Water Local Authorities	More schemes to prevent pollution and environmental nuisance.	Time consuming to organise. Cost to householders.
4. Lobby for new legislation if necessary.	NRA DoE Local Authorities	To cover areas not currently addressed.	Legislation liable to take a long time.
5. Control routine maintenance requirements of private facilities by registration scheme & maintenance contract.	Local Authorities	Reduction in number of problem locations.	Time consuming and expensive to establish. Cost to householder.
6. Review of BS6297:1983, in particular advice on assessment of ground conditions.	British Standards NRA DoE Local Authorities	Improved assessment of site suitability.	Liable to take a long time.
7. Promote accreditation scheme for small (package) sewage treatment works.	DoE NRA Small plant manufacturers.	Improved performance specification.	Takes time to develop.

ISSUES AND OPTIONS

ISSUE No: 5	Stewardship role for abundant surface waters		
OPTIONS/ACTIONS	Responsibility	Benefits	Constraints
<p>1. Include new river flow control point, probably at Dolwen between Llanidloes and Newtown (review of River Severn Statutory Control Rules).</p>	<p>NRA in consultation with river users.</p>	<p>Ability to control reservoir releases from Llyn Clywedog at times of local low flow but when flows at existing Bewdley Control Point are adequate.</p> <p>Maintenance of and/or improved existing fish stocks, conservation value and amenity use.</p>	<p>Improvements needed to hydrometric flow measurement facilities at Dolwen.</p> <p>Ensure river releases are not disproportionate to benefits.</p>

ISSUES AND OPTIONS

ISSUE No: 6	River regulation and reservoir control		
OPTIONS/ACTIONS	Responsibility	Benefits	Constraints
<p>1. Review reservoir control rules. (See actions under Issue No 5.)</p>	<p>NRA in consultation with <u>local</u> river users in respect of river releases.</p> <p>North West Water and Severn Trent Water in consultation with NRA in respect of drawoff control from Lake Vyrnwy.</p>	<p>Correct quality of water enters river according to intake level.</p> <p>Correct quality of water is drawn off from Lake Vyrnwy for supply.</p> <p>Sudden changes of river conditions downstream of reservoir are avoided.</p> <p>Hydropower generation from river releases is optimised.</p> <p>Some measure of flood amelioration.</p>	<p>Must ensure that river releases do not exacerbate natural river flooding.</p> <p>Must ensure poor quality water is not released or drawn off from reservoirs at critical times.</p> <p>Must ensure that reservoir levels are not excessively lowered by hydropower generation.</p>

ISSUES AND OPTIONS

ISSUE No: 7	Export of water from the catchment		
OPTIONS/ACTIONS	Responsibility	Benefits	Constraints
1. Assess scope for reduced exports from Lake Vyrnwy.	NRA North West Water	Extra water could support demands from the River Severn which arise beyond the provision already made through full development of the Shropshire Groundwater Scheme.	Need for water supplies in NW England to be met.

ISSUE No: 8	Future transfers of water using the River Severn		
OPTIONS/ACTIONS	Responsibility	Benefits	Constraints
1. Investigate River Severn as a carrier of water for subsequent abstraction and use in neighbouring NRA regions. 2. Investigate possible extended use of existing reservoirs or of enlarged reservoirs or via 'imported' transfers to augment River Severn flows.	NRA in consultation with river users. Developers to demonstrate environmental acceptability of proposal. As above.	Better distribution of water resources between areas of plenty and of shortage. As above.	Environmental impacts of 'imported' and 'exported' water on receiving watercourses. Safeguarding of functional role of existing reservoirs where these are to be redeployed and/or enlarged.

ISSUE No: 9	Reliability of water supplies in meeting peak demands.		
OPTIONS/ACTIONS	Responsibility	Benefits	Constraints
1. Appraise water supply reliance on scattered gravel sources to include existing source at Llandinam and that under development near Fron.	NRA Severn Trent Water	Avoidance of environmental problems in numerous locations. Improved quality control of water supplied and possible improved reliability of supplies.	Complex water supply system infrastructure is uneconomic in an area of low population density.
2. Reconsider River Severn abstraction either in Vale of Powys or via a piped extension from Shelton, Shrewsbury.	NRA Severn Trent Water	Conjunctive use of sources, which should minimise adverse environmental impacts and increase reliability of supplies. Avoids development of further scattered sources.	Need to avoid obstruction of flood plain.
3. Consider bulk supplies of treated Vyrnwy water from North West Water.	NRA North West Water	Improved reliability of supplies.	

ISSUES AND OPTIONS

ISSUE No: 10	Shropshire Groundwater Scheme (SGS) use and impacts		
OPTIONS/ACTIONS	Responsibility	Benefits	Constraints
1. Monitor impact of pumping Phase II Scheme boreholes.	NRA	Safeguarding of water supplies during dry weather, amenity use and wetland habitats.	SGS use controlled by NRA "R Severn Operating Rules" Agreement.
2. Provide alternative water supplies to compensate for local derogation of wells and boreholes.	NRA	Reliability of local water supplies.	Severn Trent Water Authority (SGS Order) 1981.

ISSUES AND OPTIONS

ISSUE No: 11	Use of River Severn water for Montgomery Canal		
OPTIONS/ACTIONS	Responsibility	Benefits	Constraints
1. Monitor 1988 Agreement between STWA and British Waterways re limits on canal inflows from Rivers Severn and Tanat.	NRA British Waterways	Reduction of losses from River Severn regulation system means reduced likelihood of use of Shropshire Groundwater Scheme in any one season, with consequent cost savings to NRA.	Requirement to pipe water back to the River Severn at Wern unless canal operator can demonstrate to NRA that significant losses are not occurring.

ISSUE No: 12	Abstractions from river gravels use and impacts		
OPTIONS/ACTIONS	Responsibility	Benefits	Constraints
1. Determine licences for abstraction from river gravels according to depth, areal extent and degree of hydraulic continuity of the deposits with adjacent rivers.	NRA	Locally available high quality water for all uses.	Limited ability to extend abstractions from gravels. Need to be cognisant of any environmental impacts on local interests.
2. Identify gravel sources which are important for water resources, and are therefore not recommended for mineral extraction.	Local Authorities Mineral Plans NRA	Protection of water resources.	Many non-alluvial superficial deposits are exempt from licensing (see issue No 14)

ISSUES AND OPTIONS

ISSUE No: 13	Lake Vyrnwy possible future change of use		
OPTIONS/ACTIONS	Responsibility	Benefits	Constraints
1. Investigate the scope for extending use of Lake Vyrnwy for significant <u>extra</u> regulation of River Severn flows.	NRA and river users North West Water	<p>Considerable increases in water availability for transfer to Thames, South Western and Anglian Regions during periods of low flow in these Regions.</p> <p>Fisheries, Conservation and amenity uses of higher summer river flows.</p> <p>Reduced winter overspill from Vyrnwy Dam so some flood mitigation downstream.</p>	<p>Need to deploy alternative resources in North West Region.</p> <p>Possible need to modify valve release arrangements. Need to check impacts on Afon Vyrnwy of sustained large releases in summer.</p>

ISSUES AND OPTIONS

ISSUE No: 14	Groundwater abstraction licensing exemptions		
OPTIONS/ACTIONS	Responsibility	Benefits	Constraints
1. Review licensing exemptions policy.	NRA in consultation with abstractors and environmental interests.	<p>Clarification of extent to which the absence of licensing of groundwater in the exempt area has resulted in unacceptable derogations or environmental impacts.</p> <p>Consistency of regulatory role. Improved protection for existing abstractors from derogation of supplies.</p>	<p>Statutory baseline is challenged, which can be a protracted process.</p> <p>National policy guidelines.</p>

ISSUE No: 15	Protection of rare and threatened species		
OPTIONS/ACTIONS	Responsibility	Benefits	Constraints
<ol style="list-style-type: none"> 1. Maintain and improve bankside cover as habitat for otters. 2. Develop policy on mink. 3. Identify current distribution of alien crayfish species. 4. Develop Regional NRA Policy on alien crayfish & restrict introductions to the catchment where appropriate. 5. Survey and identify conservation requirements for floating water-plaintain. 	<p>NRA Landowners</p> <p>English Nature(EN)/CCW Wildlife Trusts Landowners</p> <p>NRA/Ministry of Agriculture, Fisheries & Food(MAFF)</p> <p>NRA/MAFF</p> <p>EN/CCW</p>	<p>Increased otter population.</p> <p>Reduction of disturbance to otters.</p> <p>Assessment of scale of crayfish problem.</p> <p>Protection of native crayfish populations.</p> <p>Conservation of protected species.</p>	<p>Some possible loss of agricultural land.</p> <p>Limitations on crayfish farming opportunities.</p>

ISSUES AND OPTIONS

ISSUE No: 16	Opportunities for amenity and recreation		
OPTIONS/ACTIONS	Responsibility	Benefits	Constraints
1. Long term resourcing of nature reserve management on Montgomery Canal.	British Waterways(BW) Canal Restoration Trust(CRT)	Partial preservation of botanical status of canal.	Possible conflicts with other river users
2. Develop new fishing facilities on Montgomery Canal.	BW CRT	Increase in angling resource.	
3. Provide canoe launches on River Severn 'free navigation'.	NRA British Canoe Union Landowners Local Authorities	Access to river for canoeists.	
4. Promote and develop waterside footpaths at Hafren Forest, Llanidloes, Newtown and at wetland nature reserves.	NRA Forest Enterprise Local Authorities County Wildlife Trusts	Increase of informal recreational opportunities.	

ISSUE No: 17	Restoration of damaged habitats		
OPTIONS/ACTIONS	Responsibility	Benefits	Constraints
1. Develop and implement Severn Valley wetlands strategy.	NRA/CCW RSPB Wildlife Trusts	Restoration of lost wetland habitats and improved management of existing.	Financial
2. Improve riparian and instream habitat Afon Trannon/Cerist.	NRA	Restoration of former biological status and fishery.	Level of flood risk afforded by flood defences.
3. Improve compacted salmon spawning gravels where appropriate.	NRA	Improved salmon rearing capacity of affected rivers.	
4. Improve riparian and instream habitat on River Morda.	NRA	Restoration of former biological status and fishery.	Freeboard and flood risk.
5. Promote Tir Cymen, Countryside Stewardship and other appropriate schemes in riparian locations.	CCW/MAFF/ NRA	Incentives for farmers to carry out conservation improvements.	Limitations on farming practices.
6. Investigate riparian tree planting and fencing opportunities and implement where appropriate.	NRA Riparian Owners	Restoration of riparian and river corridor habitats for wildlife.	Restrictions on stock access to river banks, limitations on farming practices.
7. Restore old and create new wetland habitats.	NRA EN/CCW Wildlife Trusts	Restoration of lost wetland habitats, habitat diversity.	Loss of some agricultural land.
8. Develop Regional NRA Policy on invasive weed control and implement on NRA landholdings.	NRA	Restoration of natural riparian vegetation.	

ISSUES AND OPTIONS

ISSUE No: 18	Obstacles to salmon migration		
OPTIONS/ACTIONS	Responsibility	Benefits	Constraints
1. Improve access for spawning salmon to upper reaches of the Afon Garno.	NRA	Enhancement of stocks by utilising extra nursery areas.	
2. Investigate means of providing access for spawning salmon to the upper reaches of the River Mule.	NRA	Enhancement of stocks by utilising extra nursery areas.	Possible loss of weirs
3. Stock rivers above other obstacles with local hatchery reared salmon fry and/or transport adult salmon upstream.	NRA	Enhancement of stocks by utilising extra nursery areas.	
4. If acidification problems improve, provide access for salmon to the River Severn upstream of Felindre Weir.	NRA	Enhancement of stocks by utilising extra nursery areas.	
5. Implement legislative powers to prevent third parties creating new obstacles to salmon migration.	NRA	Protection of existing salmon spawning areas.	Limitations on development.
6. Investigate opportunities for alternative funding of improvements in light of diminishing Grant in Aid (GIA).	NRA	Enhancement of Salmon stocks.	Possible lack of funding sources.

ISSUES AND OPTIONS

ISSUE No: 19		Maintenance of native brown trout populations		
OPTIONS/ACTIONS	Responsibility	Benefits	Constraints	
1. Safeguard habitats.	See issue no.1, options 1, 2, 6	See issue no.1, options 1, 2, 6.	See issue no.1, options 1, 2, 6.	
2. Resolve acidification problems.	See issue no.2, all options.	See issue no.2, all options.	See issue no.2, all options.	
3. Determine and implement policy on Section 30 Stocking Consents for brown and rainbow trout in rivers.	NRA	Protection of native brown trout populations.	Limitation of stocking practices.	
4. Protect isolated population of native brown trout in upper reaches of Afon Dulas.	NRA	Protection of pristine native trout stock.	Limitation of potential salmon nursery area.	
5. Assess present status and identify any declines of brown trout populations in the catchment.	NRA	Determination of current status of trout stocks.		
6. Determine measures to mitigate any declines in river brown trout populations.	NRA	Improvements in trout stocks and in angling potential.		

ISSUES AND OPTIONS

ISSUE No: 20	Poaching and illegal fishing		
OPTIONS/ACTIONS	Responsibility	Benefits	Constraints
1. Maintain surveillance and anti-poaching patrols by Water Bailiffs.	NRA	Protection of stocks. Control of illegal activity.	
2. Water bailiffs visit major potential outlets for salmon.	NRA	Control of market in illegally caught fish.	
3. Review fishery byelaws to combat illegal salmon fishing in close season.	NRA	Protection of stocks. Control of illegal activity.	

ISSUE No: 21	Piscivorous birds		
OPTIONS/ACTIONS	Responsibility	Benefits	Constraints
1. Liaise and promote awareness on control and impacts of piscivorous birds.	MAFF NRA EN/CCW RSPB	Protection of birds and fish stocks.	
2. Publicise and implement NRA policy on piscivorous birds.	NRA	Protection of birds and fish stocks.	
3. Monitor impacts of piscivorous birds on local fish stocks.	NRA	Possible protection of fish stocks.	

ISSUE No: 22	Erosion and illegal river works		
OPTIONS/ACTIONS	Responsibility	Benefits	Constraints
1. Promote awareness in agricultural community of damaging impacts of unauthorised river works.	NRA	Maintenance of biological status and fishery.	Potential loss of agricultural land through erosion.
2. Enforce Water Resources Act 1991 to prevent unauthorised river works.	NRA	Maintenance of biological status and fishery. Protection of adjacent landowners from increased erosion impacts.	Limitations to farming practices.
3. Notification of Dolwen/Penstrowed geomorphological SSSI on River Severn.	CCW	Maintenance of existing geomorphological status of river.	Limitation to farming practices, plus cost of management agreement payments.
4. Enforce fisheries legislation to protect salmon spawning gravels from unauthorised river works.	NRA	Maintenance of the salmon rearing potential of rivers.	Limitations to farming and mineral extraction practices.

ISSUES AND OPTIONS

ISSUE No: 23	Water level management in the Severn/Vyrnwy confluence area		
OPTIONS/ACTIONS	Responsibility	Benefits	Constraints
1. Develop long term environmental strategy for water level and landuse management in the confluence area.	NRA,EN/CCW, Landowners, Internal Drainage Boards, Country Landowners Association, MAFF	Restoration of wading bird and wildfowl populations.	Limitations to agricultural practices, prolonged water cover on land.
2. Develop and implement strategy for flood defence capital and maintenance works in the confluence area.	NRA	Continued protection of land and property from flooding. Prioritisation of works.	No enhancement of water environment beyond narrow corridor.
3. Merge environmental and flood defence strategies to form overall strategy.	NRA	Unified approach to confluence strategy.	
4. Identify sites of archaeological importance in the confluence area.	NRA	Protection of cultural heritage.	
5. Promote Set-Aside, Tir Cymen, Countryside Stewardship and other appropriate schemes in riparian locations.	CCW/MAFF/NRA	Incentives for farmers to carry out conservation improvements.	Limitations on farming practices.

ISSUES AND OPTIONS

ISSUE No: 24	Preservation and definition of flood plain		
OPTIONS/ACTIONS	Responsibility	Benefits	Constraints
1. Press for policies to be included in Local Plans to protect flood plain from development.	LPAs NRA	New properties do not flood, existing flooding is not made worse, less call on emergency services.	Limitation of developable land.
2. Press for policies in Local Plans to remove redundant structures from flood plain.	LPAs NRA	Alleviation of existing flooding.	As above. May have adverse financial implications to users of redundant structures.
3. Install more level and flow gauging stations.	NRA	Better data for flood plain definition and advice to customers.	Capital costs of more stations and revenue to run them.
4. Carry out ground level surveys and computer modelling.	NRA	Flood plains can be identified without actual flood information. Improved data for development control.	Costly, time consuming, need to prioritise.
5. Update Flooding Survey for S105 Water Resources Act 1991.	NRA	Data available for use by Planning Authorities and in pre-planning applications by developers.	Maintenance of up to date maps requires constant technical input.

ISSUES AND OPTIONS

ISSUE No: 25	Caravan sites in flood plain		
OPTIONS/ACTIONS	Responsibility	Benefits	Constraints
1. Press for inclusion of Policies in Statutory Plans to prevent development of caravan sites in flood risk areas.	LPAs NRA	Minimises risk to people and property. Less call on emergency services.	Limitation on land use. Impact on tourism.

ISSUE No: 26	Impact of land use changes, including hill land improvement and afforestation, on rates of run-off		
OPTIONS/ACTIONS	Responsibility	Benefits	Constraints
1. Investigate scale of impact.	NRA	Improved input to planning process. Production of NRA policy to assist strategic planning.	Limitations on land use.

ISSUES AND OPTIONS

ISSUE No: 27	Controlling the impact of development on the water environment		
OPTIONS/ACTIONS	Responsibility	Benefits	Constraints
1. Advise developers on pre-planning enquiries.	NRA	Issues identified before work commenced.	Possibility of increased number of speculative enquiries leading to wasted staff time.
2. Liaise with Local Authorities and include appropriate policies in Local Plans.	NRA Local Planning Authorities (LPAs)	Developments have less effect on water environment.	Variable response from Local Authorities. Long term solution.
3. Include environmental enhancement as part of development, including integration of existing water-course and wetland habitats where appropriate.	NRA Developers LPAs Dept. of Transport/Welsh Office	Preservation of watercourse/ wetland habitats, prevention of flytipping.	If poorly maintained may become an eyesore.
4. Press for aftercare programmes.	LPAs NRA Developers Riparian Owners	Continued maintenance of river corridor.	Maintenance costs to Local Authority or Riparian Owners.
5. Increase NRA involvement in development briefs and planning agreements.	NRA LPAs Developers	Proper specification of mitigation measures, during development.	Requirement for staff time and additional skills.

ISSUES AND OPTIONS

ISSUE No: 28	Changes in Local Government Structure		
OPTIONS/ACTIONS	Responsibility	Benefits	Constraints
1. Establish liaison with any new authorities as rapidly as possible.	NRA Local Authorities	Maintain contacts on development control and Local Plan issues.	Disruption caused by establishment of new organisations and loss of contacts.
2. Use of database with planning policies to cover individual Council areas.	NRA	Local policies applicable to new areas.	Difficulty in assigning 'old' Local Plan policies to new Council areas.

PART II SUPPORTING INFORMATION

SECTION 4.0 CATCHMENT USES

This section details all the current and future uses of the catchment. A general description of the nature of the NRA's responsibility is given, together with a set of management objectives and targets. A Local Perspective describes the use in the catchment.

**KEY**

- Catchment Boundary
- A Road
- - - Railway
- Canal
- County Boundary
- - - District Boundary

- Montgomeryshire D C, Area in catchment = 1621 km²
- Radnorshire D C, Area in catchment = 18 km²
- Glyndwr D C, Area in catchment = 124 km²
- Oswestry B C, Area in catchment = 153 km²
- Shrewsbury & Atcham B C, Area in catchment = 83 km²
- South Shropshire D C, Area in catchment = 61 km²

4.1 DEVELOPMENT (Housing, Industry, Commerce and Infrastructure)

General

Development, be it residential, industrial or commercial, can have a major impact on other uses of a river catchment. Whilst the NRA has responsibility to protect the water environment, to achieve this aim its statutory powers need to be complemented by those of local Planning Authorities (LPAs). To ensure this co-operation, the NRA in its role as a statutory consultee of the LPAs provides advice on proposals that may have an impact on the water environment.

A major objective of this Catchment Management Plan is to provide the LPAs with a clear picture of the NRA's responsibilities and policies towards development of this catchment. The plan identifies all legitimate uses of the catchment so that those interests can be taken fully into account by LPAs in Development Plans.

The NRA has produced a series of Guidance notes for LPAs that outline methods of protecting the water environment. The NRA proposes that these should be incorporated into the LPAs' own Development Plans, whenever possible. These Guidance notes are reproduced in Appendix 2.

The NRA also seeks to pursue its aims and policies regarding development through the planning consultation process for individual proposals. Although the final decision on planning matters rests with the LPA, government guidelines advise on the need to consider the NRA's concerns when determining proposals.

Local Perspective

Almost 86% of the catchment is within Wales. Parts of five Counties fall within the catchment, of which Powys is the predominant. Of the remaining four Counties, Shropshire and Clwyd form sizeable proportions. Map 4 shows the administrative boundaries and main infrastructure within the catchment.

The draft replacement Powys Structure Plan (deposit) recognises a need for growth, and identifies a requirement for more than 4800 dwellings to be built in Montgomeryshire between 1991-2006. The great majority of these will be within the area of the catchment. The main growth areas will be the towns of Newtown and Welshpool. In Shropshire, the County Structure Plan has selected Oswestry as a strategic growth centre. It is estimated that overall an additional 7,000-8,000 houses will be built in the catchment by 2006.

The present status of Local Plans covering the catchment are shown in Table 1.

CATCHMENT USES

New initiatives for large scale employment have centred on high-tech business parks and light industrial estates. These are usually found at 'edge of town' greenfield sites eg: Buttington Cross Enterprise Park and Offa's Dyke Business Park near Welshpool, and Maes-y-Clawdd Industrial Estate, Oswestry. Montgomeryshire Local Plan (consultation draft) has identified further needs for new prestige sites and expansion of existing sites, and also for smaller scale sites in selected villages and rural workshop developments. Planning permission has already been granted for a large integrated meat processing facility on a greenfield site near Llandrinio. Although development is currently on hold, the site has generated considerable interest. It is important that adequate drainage infrastructure can be provided for both new and expanded sites, such that there is no detriment to the water environment.

Tourism has been identified as a major contribution to future employment in Mid Wales. The Welsh Tourist Board launched a major new strategy, Tourist 2000, in March 1994. This is likely to lead to increased demands for recreation, leisure and accommodation facilities (caravan parks, hotels etc.), all of which may impact on the water environment.

Recent road schemes and improvements (including the A5 Shrewsbury bypass linking with the M54/M6) have made the area more accessible to the West Midlands, Merseyside and Greater Manchester.

Strategic road links tend to be either east-west (A458, A470), or north-south (A483). Several road schemes, improvements and bypasses have been completed in recent years, including the A458/A483 Welshpool Relief Road. A number of major road schemes are currently under consideration in the catchment. A priority is to progress the A458 Welshpool-English Border scheme, this link being vital to economic regeneration in a large part of Mid Wales.

The Montgomeryshire Airport, which has recently been developed near Welshpool, has been identified by the local planning authority as having a role in attracting business growth to the area.

Around 95% of the catchment (including that part within Wales and the Marches Area of Shropshire) now benefits from designation by the European Commission as eligible for Objective 5b assistance. This status results in EC resources being available to overcome problems facing the rural economy and assist development. Within the Marches, resources will be targeted towards economic and business development and diversification, tourism, farm-related development, local communities and the environment. An objective of the programme is to ensure all measures assisted respect the principles of sustainable development.

CATCHMENT USES

Objective The objective for this use is:

- * To ensure that development does not adversely impact on the water environment, and wherever possible, to ensure that it proceeds in a way that benefits the water environment.

Environmental Requirements The requirements for this use are:

Water Quality * The water environment should not suffer any detriment due to development.

- * Adequate pollution prevention methods, that are consistent with the NRA's Policy and Practice for the Protection of Groundwater (Groundwater Protection Policy) and the NRA's Guidance Notes, should be incorporated into developments.

Water Quantity * Protection of surface and groundwater resources from the adverse effects of development, including mineral extraction, landfill, afforestation, road construction and other changes in land use.

Physical Features * The risk of flooding on new development should be kept within the standards of service, recommended by MAFF and the NRA.

- * To ensure any work that is needed to reduce the risk of flooding created by the development is paid for by the developer and not from public funds.

- * Adequate access (and responsibility) should exist for proper maintenance at watercourses and structures within them, including flood defence schemes.

- * Wildlife associated with the water environment should not suffer any detriment due to development, and wherever possible, development should enhance wildlife.

TABLE 1 **LOCAL PLANNING AUTHORITIES AND DEVELOPMENT PLANS**

Local Authority	Percentage of Catchment Area	Population Estimated in Catchment	Development Plan and Current Status
Powys County Council	79%	47700	Powys County Structure Plan (Draft Replacement) 1991-2006 - on deposit May 1994. Minerals Local Plan - Public Inquiry Sept 1994.
Montgomeryshire District Council	78%	47600	Montgomeryshire Local Plan - Consultation Draft October 1993. Waste Disposal Local Plan due March 1995.
Radnorshire District Council	1%	100	Radnorshire Local Plan, Consultation Draft July 1994.
Shropshire County Council	14.5%	25500	Shropshire County Structure Plan 1989-2006 - operative from 1 Jan 1993 . Shropshire Minerals Local Plan - Consultation Draft July 1994. Shropshire Waste Management Plan - Consultation Draft due end 1994.
Oswestry Borough Council	7.5%	21800	Oswestry Rural Area Local Plan - adopted 1991. Oswestry Borough Local Plan (District Wide) - Consultation Draft July 1994.
Shrewsbury & Atcham Borough Council	4%	2800	Shrewsbury & Atcham Rural Area Local Plan - adopted 9 June 1992. Shrewsbury Urban Area Local Plan - adopted 1985. Shrewsbury & Atcham Local Plan (District Wide) - Work in progress.
South Shropshire District Council	3%	900	South Shropshire Local Plan - Inspectors Report of Public Inquiry published February 1994.
Clwyd County Council	6%	1600	Clwyd County Council Structure Plan (1986-2006) Second Alteration - March 1994.
Glyndwr District Council	6%	1600	Glyndwr District Local Plan - adopted 14 February 1994.
Dyfed County Council	<1%	n.s.	Dyfed County Structure Plan - adopted 1983, Review underway late 1993.
Ceredigion District Council	<1%	n.s.	Ceredigion District Local Plan - Consultation Draft due summer 1994.
Gwynedd County Council	<1%	n.s.	Gwynedd County Structure Plan (1991-2006) - adopted 29 October 1993.
Meirionnydd District Council	<1%	n.s.	Eryri Local Plan - Consultation Draft due Autumn 1994.

n.s. not significant.

4.2 ABSTRACTION - SURFACE WATER AND GROUNDWATER

General

The removal of water from streams, rivers or groundwater by man is termed **abstraction**. Abstractions are controlled by licences granted under the Water Resources Act 1991. The abstraction licensing process ensures that the NRA can manage water resources so as to ensure that the right balance is struck between the needs of abstractors and the environment. Exemptions from the requirement for a licence include most types of water supplies to a single household, and small (not more than 20 cubic metres a day) general agricultural uses from surface water (excluding spray irrigation). Also, large areas of North, Mid and West Wales and smaller areas of England are exempt from the licensing requirement for abstractions from groundwater (wells and boreholes), regardless of use. There are a number of other specific types of abstraction (eg. firefighting) which are exempt from the need for a licence.

All abstraction licences specify maximum volumes that the licence holder may take, and many contain conditions to protect the environment and other abstractors. The exceptions are licences granted as Licences of Right in 1965, or "Licences of Entitlement" in 1990 where the legislation did not permit the NRA and its predecessors to restrict pre-existing abstractions. In considering application for new licences, the NRA must ensure that there is no derogation of existing abstractors without their agreement, and that the aquatic environment and associated habitats are properly safeguarded. The NRA does not guarantee that the authorised volume will be available, nor that the water will be fit for the purpose for which it will be used.

This use includes the supply of water from ground and surface sources for public supply and for industrial, agricultural, amenity, hydropower, water transfer and fish farm use. Public water supplies are mainly taken from surface waters - rivers, streams and reservoirs - but groundwater sources can be important on a local scale. Private supplies are generally derived from springs and boreholes and their quality is monitored by the Local Environmental Health Officer. The NRA is not responsible for the quality of the raw water, nor of the delivered, treated water. However, it does have a duty to protect water quality and will specify protection zones around groundwater sources that seek to control certain potentially polluting activities. The Policy and Practice for Protection of Groundwater forms the basis for the NRA's activities in this area.

Problems can occur when surface water is abstracted for spray irrigation as there is a large percentage loss due to evapotranspiration. This problem is compounded in the summer months when spray irrigation is needed as the flow is low at this time of year. To minimise the impact on the water resources and to protect existing rights when river flow falls below a certain threshold, restrictions are put into operation. Winter storage reservoirs are encouraged wherever practical. Fish farming can severely affect a watercourse by diverting a large proportion of the flow through the farm, leaving the river reduced in flow. The requirement for an adequate residual flow can restrict the viability of a fish farm.

Local Perspective

The plentiful surface water resources in the catchment are reflected in the volume of surface water licensed abstractions, which are ten times by annual volume those issued for groundwater. The total licensed volume of over 112 thousand megalitres per year is distributed over 351 licences within which those for groundwater outnumber surface water licences by 2 to 1 (See Table 2).

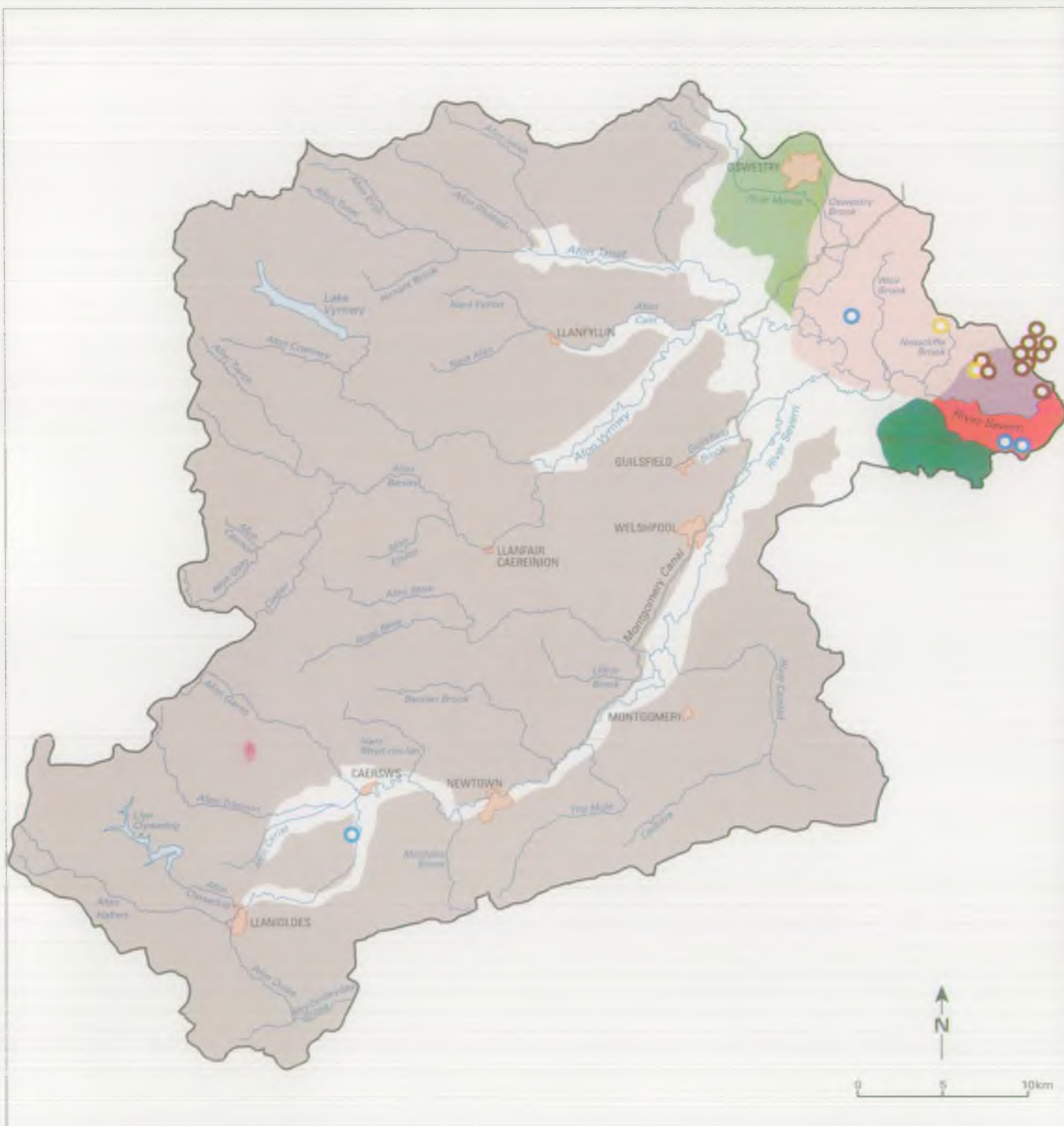
Table 2 - A Summary of Abstraction Licences in the Catchment

Type of Abstraction	Surface Water Abstraction			Groundwater Abstraction		
	No. of Licences	Abstraction MI/annum	Percent by Volume (%)	No. of Licences	Abstraction MI/annum	Percent by Volume (%)
Public Water Supply	6	95,986.50	94.55	4	9,641.94	88.63
Agriculture (other than spray irrigation)	11	41.01	0.04	210	483.67	4.45
Spray Irrigation	28	666.71	0.66	4	404.47	3.72
Private Water Supply	42	90.2	0.09	18	78.67	0.72
Cooling Water Circulated	2	491.15	0.48	1	0.23	<0.01
Industrial	9	989.75	0.98	2	270.01	2.48
Fish Farm	4	870.57	0.86			
Circulation through amenity pond	4	1,810.23	1.78			
Mineral Washing	1	272.73	0.27			
Power Production	2	205.86	0.20			
Transfer	1	54.00	0.05			
Top up water levels	2	39.51	0.04			
TOTALS	112	101,518.22		239	10,878.99	

The overwhelming majority of water (over 90%) is licensed for abstraction for public water supply. This largely reflects the *strategic* importance of the catchment for water resources which is considered as a separate use in Section 4.3. The remainder of Section 4.2 is concerned with the deployment of water resources for use *within* the plan catchment itself.

Within the catchment the major abstracted water use is for public water supply and is more or less equally shared by 3 groundwater sources at Kinnerley, Ford and Eyton which abstract, respectively, from the Knockin and Alberbury (2) Groundwater units in the north east of the catchment. Their total licensed abstraction at 12.7 MI/d (4643 MI/a) is similar to the other main public water supply source at Llandinam at 13.7 MI/d (4999 MI/a). This is an abstraction from the river gravels adjacent to the River Severn between Llanidloes and Newtown.

Abstractions for other uses are relatively small with total usage in the range 1000 MI/a to 2000 MI/a for amenity pond circulation, for industry and for agricultural spray irrigation. Of the 28 spray irrigation licences from surface water nearly a



KEY

- Catchment Boundary
- Canal
- Public water supply > 1 MI/d
- Spray irrigation > 1 MI/d
- Shropshire G' water Scheme > 1 MI/d

Groundwater Licence Exemption Area

GROUNDWATER UNITS

COAL MEASURES

Oswestry

Hanwood

SHERWOOD SANDSTONE

Ensdon

Knockin

Alberbury



KEY

- Catchment Boundary
- Canal

- Public Water Supply > 1MI/d
- Industrial > 1MI/d
- Fish Farm > 1MI/d
- Mineral Washing > 1MI/d
- NRA Limewell > 1MI/d
- Spray Irrigation > 1MI/d

half are subject to restriction depending on prescribed flow thresholds at NRA gauging stations. Details of restricted licences are given in Table 3.

Table 3 - Abstraction Restrictions Dependent on Prescribed Flows in Surface Watercourses at NRA Gauging Stations.

Source of Abstracted Water and Use	No of Licences	Watercourse used for PF	NRA Gauging Station	Flow Threshold MI/d	Type of Restriction
R Morda (West) SI	1	River Severn	Bewdley	770	Cease
R Morda (East) SI	1	River Severn	Bewdley	770	Cease
R Vymwy SI	1	River Severn	Bewdley	770	Cease
R Vymwy SI	1	River Severn	Bewdley	770	Cease
R Tanat SI	1	River Tanat	Llanyblodwel	55	Cease
Afon Cain SI	1	River Tanat	Llanyblodwel	55	Cease
Caebitra SI	1	Rea Brook	Hookagate	18	Cease
Cynllaith SI	2	River Tanat	Llanyblodwel	55	Cease
Afon Rhiw Top-up	1	River Tanat	Llanyblodwel	55	Cease
R Morda SI	1	River Perry	Yeaton	40	Cease

SI = Spray Irrigation PF = Prescribed Flow

A large proportion of the catchment is exempt from licensing for groundwater abstraction (see Issues Section 3.2 No 14 and Map 5). Much of the area concerned has only shallow and unreliable groundwater from which, nonetheless, locally important private water supplies are drawn.

In addition to the above limited quantities are abstracted for fish farming, for mineral washing and for power production. Nearly two thirds of all licences relate to groundwater abstractions for use in agriculture *other than* spray irrigation.

Finally within the catchment, there are five boreholes in the Ensdon Unit which form part of the Shropshire Groundwater Scheme - a strategic facility described more fully in Section 4.3.

Demand for public water supply within the catchment is expected to rise by over 10% by 2021. This will be met either from further river gravels abstractions or from River Severn intakes either in the Vale of Powys or from the existing Shelton intake just upstream of Shrewsbury.

Maps 5 and 6 respectively show licensed groundwater and surface-water abstractions greater than 1 Megalitre/day.

Objectives

The objectives for this use are:

- * To manage abstraction to long term sustainable levels.
- * To encourage efficient water use including leakage reduction, efficient irrigation and winter storage for summer use, and to optimise re-use.
- * To safeguard public supply abstraction sources with respect to water quality and quantity.
- * To ensure the protection of groundwater, particularly river gravels, through the Policy and Practice for the Protection of Groundwater, land use planning and other appropriate means.
- * To actively enforce the conditions of abstraction licences to protect the rights of other abstractors and the aquatic environment.
- * To develop and publish a clear licensing policy for abstractions in the catchment.
- * To ensure that the discharge arising from fish farms and hydropower abstractions is returned as close as possible to the point of abstraction.
- * To encourage abstractions to be made as far down a river or stream as is practical to minimise the effect of the abstraction on river flows.

Environmental Requirements

The requirements for this use are:

- | | |
|--------------------------|--|
| Water Quality | <ul style="list-style-type: none"> * Relevant river stretches to meet standards set for the protection of waters used for irrigation and agricultural abstraction. * The quality of water at licensed potable surface and groundwater abstractions should meet the standards set out in the EC Surface Waters Directive (75/440/EEC) and the standards for Aesthetic Criteria. |
| Water Quantity | <ul style="list-style-type: none"> * Water to be available to allow abstraction up to the amounts authorised and within the terms specified in the abstraction licences. |
| Physical Features | <ul style="list-style-type: none"> * Abstraction and associated activities must not lead to an unacceptable reduction in or alteration to the physical habitats required by other uses. |





KEY

— Catchment Boundary

Existing

— Regulated Rivers

--- Aqueduct

Possible*

— Regulated Rivers

--- Aqueduct

4.3 STRATEGIC WATER RESOURCE USE

General

The NRA's ability to control the management and development of water resources is dictated by European Community (EC) and UK legislation, in particular the Water Resources Act 1991. The NRA's principal aim in relation to water resources is to manage them to achieve the right balance between the needs of the environment and those of the abstractor. Water Resources use considers minimum flow needs and therefore sets prescribed Flows (refer Section 6.3)

The planning of water resources is an ongoing process which requires a wide measure of participation from users and those affected by water use. Demands for water resources may comprise those from within an NRA Region, and those at a national level. Environmental considerations are crucial; where doubt exists, a precautionary principle will be adopted.

Local Perspective

The catchment is strategically important as both an existing and potential provider of water resources for a large part of central, north west and south west England. This has been highlighted in Section 3, issues 5, 7, 8, 10 and 13. There is, however, a strong possibility that demands can be managed to minimise the need for large scale water resources developments over the next 20 years or so.

On the River Severn the flow is regulated to ensure minimum flow needs are met. The sources of water used for flow regulation are mostly located in the plan area but use of this water is largely 'strategic' i.e. occurs outside the plan area further down the River Severn. Further details of supported abstractions and residual flows will be published in the plans for River Severn - Middle Reaches and Lower Reaches.

Llyn Clywedog, Lake Vyrnwy and the westernmost part of the Shropshire Groundwater Scheme fall within the plan area. They are all used to regulate the flow of the River Severn, but in the case of Lake Vyrnwy resources are also deployed to Liverpool.

Phase 2 of the Shropshire Groundwater Scheme includes 10 boreholes in all, of which 4 sites (5 boreholes) lie within the plan area and the other 5 just outside the boundary. The boreholes within the plan area are located at Rodefern (SJ 4046 1820), Ensdon (SJ 4092 1731), Forton (SJ 4313 1751) and Knolls (No 1 SJ 4226 1741, No 2 SJ 4231 1751). Of the 5 external sites, 3 sites contribute groundwater discharge to the River Severn within the plan area, via a pipeline. The remaining 2 sites discharge directly to the River Perry which is just outside the plan area.

CATCHMENT USES

The significance of this 'strategic' water use requires decision-making to take account of needs far beyond the confines of the plan area when determining control rules for Llyn Clywedog, Lake Vyrnwy and the Shropshire Groundwater Scheme. Detailed investigation of the environmental impact of changes to the flow regime in the River Severn would be carried out prior to any decision being taken on strategic water use.

Map 7 summarises existing and potential strategic water resource use within the catchment, and Map 5 shows the location of the Shropshire Groundwater Scheme Boreholes.

Objective

The objective for this use is:

- * To ensure that all decisions taken about Llyn Clywedog, Lake Vyrnwy and the Shropshire Groundwater Scheme take into account the needs of abstractors and in-river water users outside the plan area.

Environmental Requirements

The requirements for this use are:

- * Water 'exported' from the Catchment by the Vyrnwy aqueduct is used directly for public water supply with primary filtration at Llanforda near Oswestry. Further treatment is provided in north western England before use.
- * Water from Llyn Clywedog is regularly sampled to ensure that there is not a build up of high manganese water. Releases from the reservoir are carefully selected to prevent excessive temperature changes in the river downstream.
- * Releases from the Shropshire Groundwater Scheme are passed through a sand trap and an aerator to ensure adequate oxygenation of the water before release to the river.

Water Quantity

- * Releases from Llyn Clywedog to create flood drawdown retention storage are held back if downstream river levels are high to avoid any risk of exacerbating floods.
- * Control of releases from Llyn Clywedog, Lake Vyrnwy and Shropshire Groundwater Scheme needs to be carefully managed to reduce the risk of releasing excessive or inadequate amounts of water.

Physical Features

- * Loss of water from the River Severn needs to be minimised so that reservoir releases benefit the lower reaches of the river. In support of this an Agreement ensures that water entering the Montgomery Canal from the Rivers Severn and Tanat is rationed during droughts.

CATCHMENT USES

- * Physical habitat requirements in the River Severn downstream of the plan area must be respected.

4.4 HYDROPOWER AND RENEWABLE ENERGY

General

An essential part of the Government's environmental strategy is the reduction of emissions produced as a result of burning fossil fuels. The Government's policy is to encourage the exploitation and development of renewable energy sources wherever they have prospects of being economically attractive and environmentally acceptable. The NRA is keen to support this policy through the application of its powers and duties.

Renewable energy sources include water (hydropower, wave and tidal), wind, solar and geothermal power, and energy derived from waste treatment. Some renewable energy sources, such as hydropower have been commercially exploited for some time, and others such as wind power are commencing widespread commercial exploitation. Information about planning aspects of renewable energy is available in the Planning Policy Guidance Note on Renewable Energy (PPG 22 issued by the Department of the Environment and Welsh Office).

The energy sources considered in this section are those that may impact on the water environment in one way or another. Hydropower is the main catchment use considered, but reference is also made to wind power and energy derived from waste.

Water is used for the generation of hydro-electric power and is also a means of providing power to drive machinery, for example, mills. The NRA will take the use of hydropower into account in its management of water resources, and will aim to achieve the right balance between the need of the environment and those of the abstractors.

Hydropower schemes which include a physical abstraction from the river by pipe or leat require an abstraction licence from the NRA (S.24 Water Resources Act 1991). A licence is not required if there is no abstraction from the main channel and no diversion of flow. An impounding licence (S.25 WRA 1991) will be required for schemes involving the construction or considerable alteration of impounding works such as dams and weirs. Consent under S.23 of the Land Drainage Act 1991 or S.109 WRA 1991 will also be required in all cases, and there may be a requirement for a fish pass together with screening of intakes and outlets if waters are frequented by migratory fish.

Hydropower abstractions often use the whole river flow, therefore the granting of an abstraction licence has implications for later upstream development proposals. This can mean that no-one else would be granted a licence to abstract water upstream of a hydropower site. In such cases, it is the policy of the NRA to include provisions to permit further upstream abstractions up to a fixed maximum value, and to grant time limited licences. There must be an adequate residual flow in the river between the abstraction and discharge point of a hydropower abstraction. This is critical for maintaining a passage for migratory fish and the preservation of the aquatic ecosystem within the length affected.

Wind power electricity generating schemes are inevitably proposed in upland areas, where highest wind speeds are found. These areas generally coincide with the watersheds of river catchments, and include the sensitive headwaters and sources of streams and rivers.

Wind farms can impact on the water environment in two main ways - fragmentation of sensitive upland wetland habitats by the siting of turbines and interconnecting roads and tracks; and drainage from haul/access roads, transformers, substations and associated facilities. Any discharge of potentially contaminated drainage to a watercourse will require consent under WRA 1991. The construction of haul roads may involve crossing/bridging of watercourses, for which consent will be needed under S.23 Land Drainage Act 1991 or S.109 WRA 1991.

Wind generators have recently been added to the category of projects in Schedule 2 of the Town and Country Planning (Assessment of Environmental Effects) (Amendment) Regulations 1988, requiring submission of an Environmental Assessment if the development is likely to have significant environmental effects.

Waste treatment as a means of producing renewable energy includes landfill gas (methane) from waste disposal sites and bio-gas projects (anaerobic digestors). Byproducts may be produced, and any polluting discharge to controlled surface waters will require a consent from the NRA under the provisions of the Water Resources Act 1991.

Local Perspective

Water power is used to generate electricity at Llyn Clywedog when releasing water for river regulation purposes and when water levels permit. 200kw are produced for requirements at the dam, and 500kw for supplying electricity to a power company. 80kw are produced at Lake Vymwy, and a recent hydropower scheme at Dolanog is to supply 200kw of electricity. Hydropower is also used as a back-up at a flour mill at Bacheldre. No other sites using hydropower are recorded. Although hydropower is not yet a major use in the catchment, with the move towards more environmentally friendly power sources it may become more prevalent.

There is currently great pressure for the development of wind farm electricity generating schemes in the catchment and surrounding uplands. Wind farms may well become an increasing feature, and a major use, of the catchment. The 103 turbine wind farm at Llandinam is currently the largest in Europe. A 70 turbine wind farm is proposed at Carno; and planning applications have recently been made for an 83 turbine wind farm near Adfa at Mynydd yr Hendre, and a wind farm at Pen y Gwely between Oswestry and Glyn Ceiriog. Montgomeryshire could become self sufficient in electricity and possibly be a net exporter.

There are no known waste disposal or landfill sites in the catchment used for renewable energy production.

Objectives

The objectives for this use are:

- * To facilitate hydropower developments where possible.
- * Hydropower developments, which restrict the ability to use upstream water resources, to be opposed unless the licence authorising the abstraction for hydropower is subject to an agreed volume of derogation and a time limit.
- * To allow hydropower developments in such a way that they do not prevent use of upstream water resources for other purposes and do not have significant downstream impacts.
- * To ensure that discharge is made as close as possible to the point of abstraction.
- * To ensure that the upstream and downstream impacts of hydropower developments on flood risk are minimised.
- * To advise and guide restoration of historic structures.
- * To ensure that the siting of wind turbines and associated infrastructure does not adversely impact on the water environment.

Environmental Requirements The requirements for this use are:

Water Quality

- * That use of water for power generation does not result in inadequate dilution in the river system.
- * That any water storage for hydropower purposes does not result in increased plant and algal growth with consequent possible siltation problems upstream.
- * Consent conditions for discharges to adequately safeguard downstream water quality and prevent exceedence of EC Directives.

Water Quantity

- * That use of water for power generation does not adversely affect other users.
- * That there is an adequate residual flow in the river between the abstraction and discharge point of a hydropower abstraction.

Physical Features

- * The use of existing structures or creation of new areas for hydropower must not increase the risk of flooding or cause detriment to the riverine environment.
- * Structures do not entrap migratory fish.





KEY

- Catchment Boundary

- Trade Discharge
- Sewage Discharge >1MI/d
- Sewage Discharge >0.03 - 1MI/d

4.5 SEWAGE AND INDUSTRIAL EFFLUENT DISPOSAL

General

All discharges of sewage and trade effluent require a Consent from the NRA. The Consent specifies the volume that can be discharged and what it may contain. These conditions are calculated i) by taking into account the water quality and the amount of water available to dilute the effluent at the point of discharge and ii) to ensure that downstream water quality remains acceptable for all its many uses and meets the relevant water quality standards.

This use deals with the disposal of effluent to surface waters and underground strata.

Local Perspective

There are a total of 200 consented discharges within the catchment. 104 are sewage effluent or sewerage system overflows owned and controlled by Severn Trent Water Ltd, 88 are sewage effluents in other private control, individual or groups of homeowners, local councils and other Authorities. The remaining 8 discharges are trade effluent.

All discharges are monitored by the NRA. The results of this monitoring are held on a register open to public inspection at the NRA Regional Offices in Solihull.

The principal sewage discharges are from works serving Oswestry (which has a consented discharge in dry weather of 5.6 Ml/d), Newtown (3.6 Ml/d), Llanidloes (2.2 Ml/d) and Welshpool (2.2 Ml/d). The total sewage effluent discharge is approximately 20 Ml/d which is just less than 3% of the 700 Ml/d dry weather flow of the River Severn as measured at Montford Bridge.

Many sewerage systems have storm water overflows operating within the system or at the sewage treatment works. Most operate without causing nuisance, however overflows at Newtown, Llanidloes and Llanfair Caereinion located in areas of high public amenity can give rise to complaint.

Only 2 of the trade effluent discharges are of sufficient significance to present a potential impact on receiving river water quality. - North-West Water's Oswestry Water Treatment Works process waste water (7Ml/d) discharges to the Morda, where the dilution ratio is only 1:1, and Edward Hamer's Abattoir at Llanidloes which discharges 150m³/d of treated effluent to the River Severn.

CATCHMENT USES

In addition to monitoring industrial premises with known discharges, periodic visits are made to other selected sites to ensure appropriate preventative measures are taken to minimise the risk to the water environment from site operations and storage facilities, in particular those related to fuels and chemicals.

Due to the rural nature of the catchment a large proportion of properties are not connected to public or private sewage treatment works but dispose of foul sewage by means of soakage of septic tank effluent into the ground. Volumes of discharge are generally very small, invariably below 5m³/d. Such discharges are not normally formally controlled by the NRA. Larger discharges and those in particularly sensitive locations in relation to groundwater quality may be controlled by use of a Prohibition Notice under the Water Resources Act 1991.

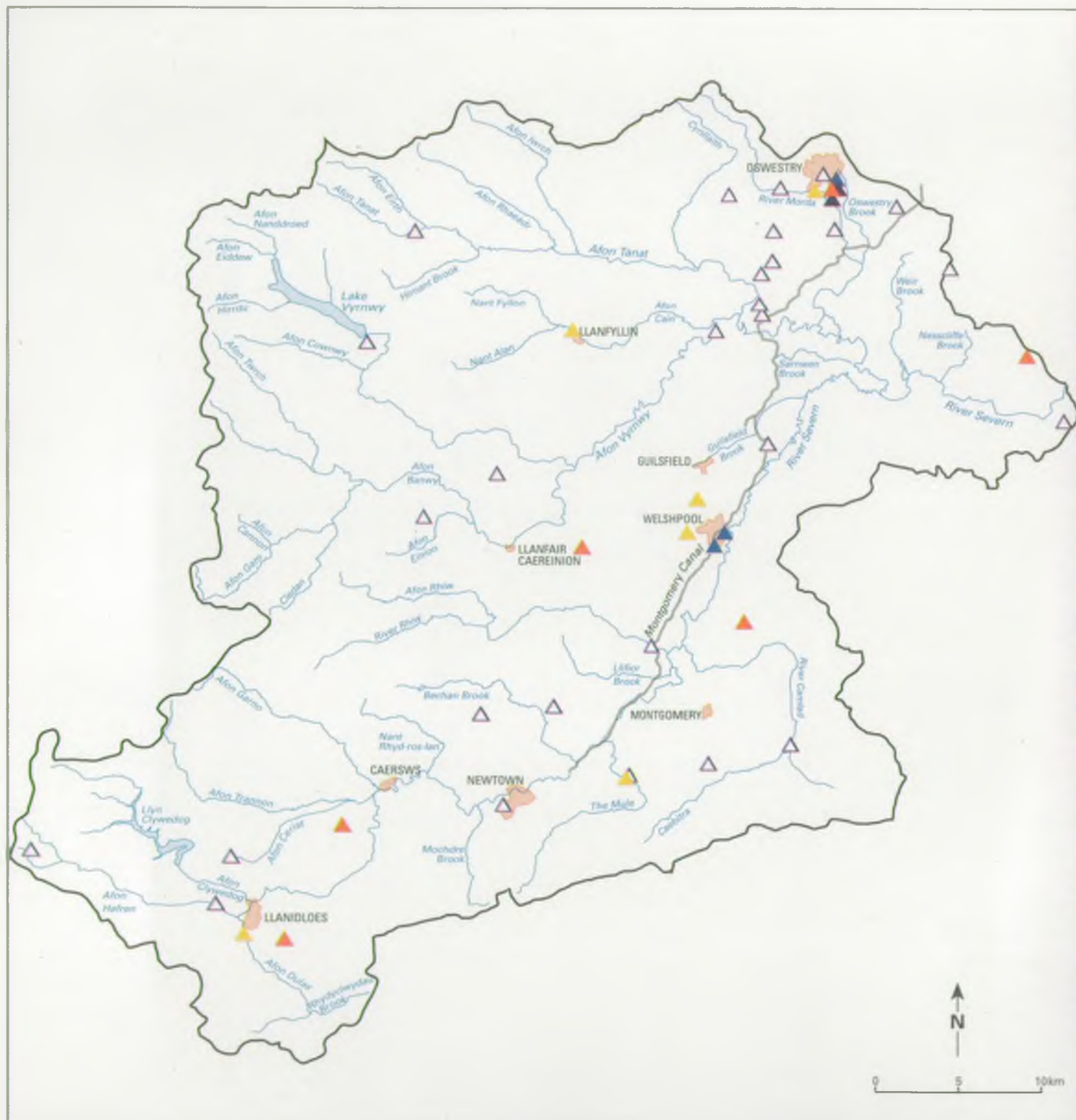
Map 8 indicates the location of the significant effluent discharges.

Objectives The objectives for this use are:

- * To allow the discharge of effluents to surface and groundwaters, whilst maintaining downstream water quality standards so that other uses are not affected.
- * To allow discharge of effluents to underground strata in a manner which does not cause adverse water quality effects.

Environmental Requirements The requirements for this use are:

- | | |
|--------------------------|---|
| Water Quality | <ul style="list-style-type: none">* Consent conditions to adequately safeguard downstream water quality and prevent exceedence of EC Directives.* Discharges to be made at a point where the risk to other uses is minimised.* Discharges to underground strata to be in accordance with the advice in the NRA's Groundwater Protection Policy.* Discharges to comply with their consent conditions. |
| Water Quantity | <ul style="list-style-type: none">* Upstream flows not to be reduced to the point where the dilution of the effluent becomes inadequate. |
| Physical Features | <ul style="list-style-type: none">* The discharge not to be so large that it alters the channel shape and size which affect conservation interests.* Outfalls to be sited so that they allow adequate mixing of the effluent and the river. |



KEY

-  Catchment Boundary
 Canal
 Open Landfill Site (Licensed)
 Closed Landfill Site (Unlicensed)
 Licensed Scrapyard
 Licensed Transfer Site

4.6 SOLID WASTE DISPOSAL

General

Land can become contaminated with significant levels of pollutants as a result of industrial and agricultural activities and through waste disposal. These pollutants can adversely affect surface and groundwater quality through run-off and percolation to underlying aquifers.

Prior to the mid 1970s there was no control over the types of waste tipped and the methods of operation relating to its disposal. Since 1976, waste disposal sites have required a licence to operate from the local Waste Regulation Authority - the County Council in England or District Council in Wales. The NRA has to be consulted about each application for a licence. The Waste Management Licence details how the site is to be constructed and operated.

A valid planning permission is also required before a Licence can be issued. The Planning Permission contains conditions which control the way in which the site is restored and monitored to prevent the closed site causing future damage to the environment. The Waste Management Licence cannot be revoked until a Certificate of Completion is issued by the Waste Regulation Authority, stating the site is unlikely to cause pollution of water.

Landfill sites can cause water pollution. This is because rain falling on the site can become contaminated and drain from the site (leachate) into groundwater or streams. If the site is properly managed, long term harm to the environment can be avoided. This can be achieved by either collecting the leachate for disposal elsewhere, treating it, or allowing it to be diluted in the groundwater where it may naturally break down. Detailed studies are being carried out to help decide on the best way to deal with leachate. Badly managed sites can lead to serious pollution problems.

The NRA has published the Policy and Practice for the Protection of Groundwater (1992) to advise planning authorities and others of the dangers of allowing certain types of development in areas where groundwater could be affected. It is designed to protect groundwater abstractions and resources in general from activities which could lead to contamination such as: waste disposal, sludge spreading and chemical storage and manufacture.

Local Perspective

The NRA has records of 46 sites in the catchment. The sites are of a mixture of current and past landfill sites, transfer stations and licensed scrapyards. Map 9 shows the location of known sites in the catchment.

These records commenced around 1972, although licensing itself was not required until 1976. A full record should be available in the Local Authority Waste Disposal Plans when published.

CATCHMENT USES

The largest site in the catchment is the landfill currently operated by Montgomeryshire DC at Bryn Posteg 3km south east of Llanidloes. It is located on the site of a disused lead mine and covers some 16 hectares. It is situated approximately 350m above sea level and as such receives a relatively high annual rainfall of 1300mm. Leachate production is therefore high and its collection, on-site treatment (by extended aeration), and disposal to foul sewer were an integral part of the site's design.

Leachate and contaminated surface water from abandoned tips and long standing scrap yards has been identified as being a problem in some cases. For example PCBs leaching into the Mule from a scrap yard have been detected in Dipper eggs although not at a detectable level in the river water.

The majority of solid waste disposal sites in this area are a consequence of the current road and urban development programme and are infills of inert soil and building wastes which do not give rise to any problems if operated correctly. It is anticipated that there will be an increased demand for waste disposal sites for canal dredgings as a result of the restoration of the Montgomery Canal. Scrap yards and Waste Transfer Stations are currently being licensed after consultation with the NRA. The potential for contamination is being reduced but only a small number of these sites have so far been controlled.

Objective

The objective for this use is:

- * To ensure that waste disposal storage and transfer activities do not adversely affect water quality or water resources.

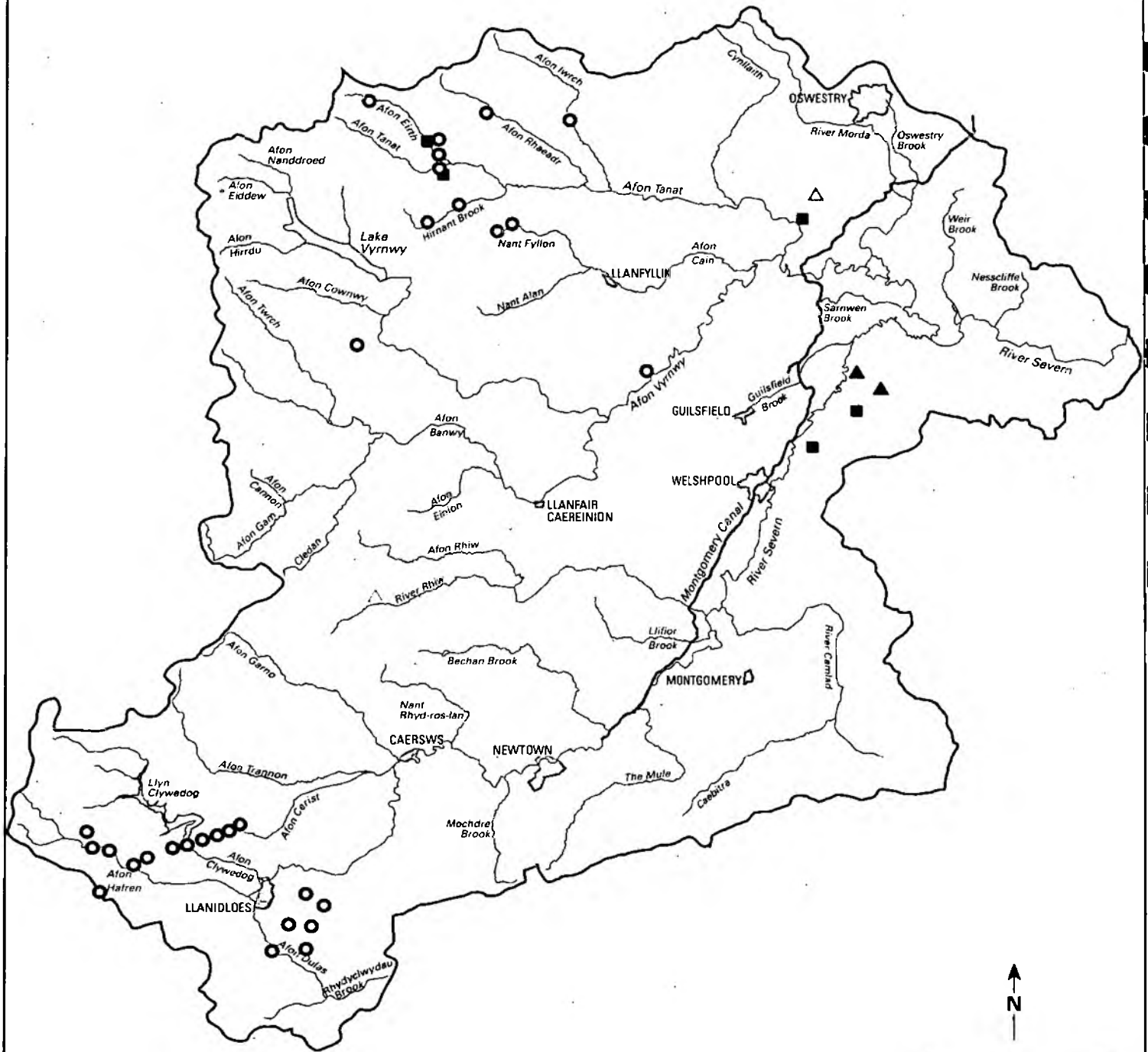
Environmental Requirements The requirements for this use are:

Water Quality

- * EC Directives on dangerous substances discharged to surface and groundwaters to be complied with.
- * Discharge consent conditions or prohibition notices to be complied with.
- * Landfill to be carried out in accordance with advice given in the NRA's Policy and Practice for the Protection of Groundwater.
- * Restored sites not to pose a long term risk to the water environment.
- * Pollution prevention measures on bunding and drainage to be fully implemented at waste transfer sites and scrapyards.
- * All waste disposal, treatment and transfer sites to be operated to the highest standard to prevent water pollution.







CATCHMENT USES

- Water Quantity** * Waste disposal activities must not harm groundwater resources or adversely affect the rights of water abstractors.
- Physical Features** * To control disposal such that watercourses and ditches are not infilled, restricted or altered.



A horizontal scale bar with three tick marks labeled 0, 5, and 10km. The bar is divided into two equal segments by the 5 km mark.

KEY

-  Catchment Boundary
 Canal
Quarries
 Limestone
 Igneous
 Gritstone
 Closed

Abandoned Mines

- ☐ Lead
- ☐ Copper
- ☐ Phosphate
- ☐ Mixed or other

4.7 MINERAL WORKING

General

Areas of current or former mineral workings pose a threat to ground and surface waters by exposing, at times, toxic spoil or veins of potentially toxic minerals to the weathering process. As a result, run off and discharges from quarries and mines can contain toxic and suspended material that are harmful to aquatic life. Discharges from active sites are subject to normal discharge consent procedures. However, discharges from abandoned mines are not adequately controlled by the law and may cause locally severe problems.

The exploitation of minerals can have a major impact on water resources by altering groundwater flows and hence streamflows. The removal of material from above the water table reduces the opportunity for natural filtering and attenuation of pollutants, which will consequently enter the groundwater more readily. Summer spring flows can be reduced as a result of the loss of water storage capacity of the mineral that has been removed. Reclamation with impermeable material will increase run off and reduce the recharge of groundwaters, whilst the use of mineral extraction sites for landfill waste disposal also poses a significant threat to groundwater quality.

Gravel extraction may take place from the river channel or flood plain and is controlled by planning law. It may also require a land drainage consent from the NRA. If extraction works are not properly managed, the river channel can be seriously damaged. There can also be serious implications for salmon and trout spawning sites.

Contaminated land reclamation schemes for mineral working sites may cause renewed, or even exacerbate existing, problems as unweathered toxic materials are exposed or fine solids run off into watercourses. Consequently such schemes require consultation with the NRA, and any discharges consented and monitored.

All mineral workings are subject to general planning controls. The NRA is a consultee on such applications, and the final planning consent should contain conditions which control the operations in order to satisfy the NRA's requirements.

Local Perspective

A considerable amount of mining has occurred through the western uplands of the catchment, although concentrated to the south and north with limited activity in between. This took place predominantly between 1850 and 1900 in the search for lead, copper and zinc. There are no active mines at present, with the last operations being in the early 1920s.

The legacy of this mining activity is numerous sites of varying sizes covered with mine spoil and underground mineral veins that have been subjected to weathering processes. Surface run off and discharges from shafts and adits of water containing metals can affect many local streams, which by accumulation in a relatively confined area of a catchment can affect the ability of some rivers to achieve EC directive requirements.

The largest abandoned mine is the Fan Mine near Llanidloes; this was the most productive metal mine in Wales in the 1870s and the largest lead mine in Europe. Spoil covers an area of some 7 hectares, causing contaminated surface water to pollute the Afon Cerist to such a degree that it is fishless and with a poor flora and fauna diversity for 8km.

A land reclamation scheme promoted by Powys County Council and funded by the Welsh Development Agency is currently being undertaken to reduce the metals contamination of the Cerist. It will also expose and enhance some of the Archaeological features of the site to create a tourist facility.

It is unlikely that any other abandoned site is individually of sufficient size or impact to make a land reclamation scheme a viable option to improve water quality.

There are only 4 known active quarries in the catchment, mainly for the extraction of stone for road construction and improvement; a brick works quarry is currently closed. Gravel extraction is undertaken intermittently on the River Severn upstream of Newtown.

Map 10 shows the locations of both active and closed quarries, and abandoned metalliferous mines within the catchment.

Objective The objective for this use is:

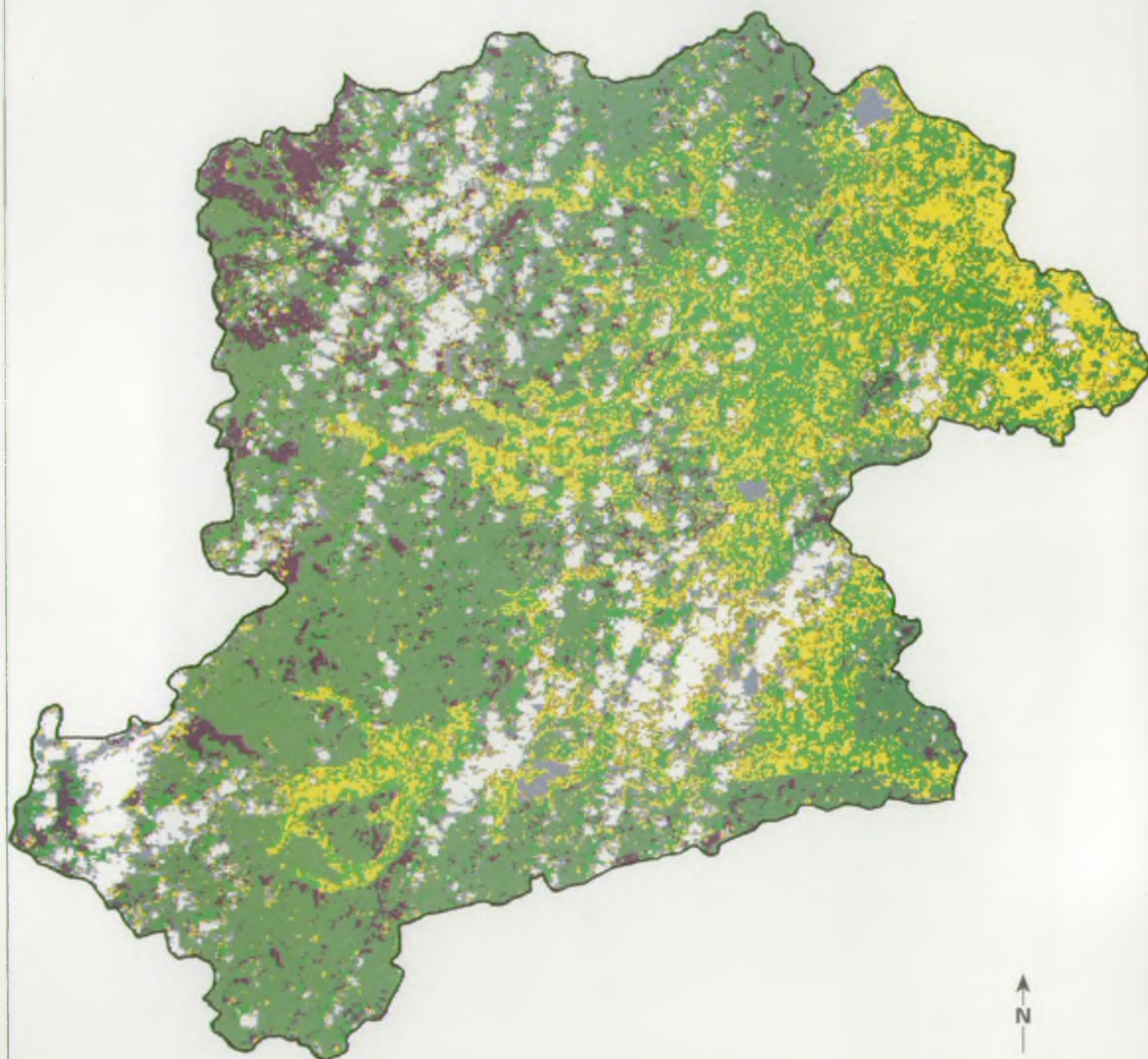
- * To ensure that mineral extraction and any associated activity including land reclamation does not adversely affect the water environment.

Environmental Requirements The requirements for this use are:

- Water Quality**
- * Consented discharges must comply with the conditions stated within the consent. This will be enforced by the NRA.
 - * Measures must be taken to prevent pollution that may arise from physical disturbance of aquifers and groundwater flow, and contaminated land, in accordance with the advice given in the NRA's 'Policy and Practice for the Protection of Groundwater'.
 - * Restored sites must not pose a long term risk to Water Quality by the use of inappropriate landfill materials.

CATCHMENT USES

- Water Quantity** *
- Mineral working and land reclamation must not have an adverse effect on surface and groundwater resources or the rights of water abstractors. Groundwater abstractions, including those for gravel dewatering must be determined in accordance with the NRA's 'Policy and Practice for the Protection of Groundwater'.
- Physical Features** *
- Mineral working, land reclamation and associated activities must not reduce the quality of the physical habitats available in the water environment.
- *
- Gravel extraction in rivers must not adversely affect salmon and trout spawning grounds.



KEY

— Catchment Boundary

Landuse Classification:

- Arable
- Grass
- Fallow/Bare
- Coniferous Woodland
- Deciduous Woodland

- Moorland/Heather/Bracken
- Upland Pasture/Rough Grass
- Urbanised/Industrialised
- Water
- Cloud/Cloud Shadow

4.8 AGRICULTURE

General

Over 80% of the land in England and Wales is used for Agriculture. Modern farming practices involve the use of a wide range of Agro-chemicals and the generation of vast quantities of animal waste, contaminated surface water and effluents, (particularly from silage storage), which are committed to land disposal. Consequently, there is significant scope for impacts on the water environment. The principal concerns of the NRA are:-

- (i) Pollution of surface waters and groundwaters from animal wastes effluents, fertilizers, pesticides and other Agro-chemicals.
- (ii) Soil erosion resulting in increased siltation of watercourses, including destruction of river banks by uncontrolled livestock.
- (iii) Land drainage leading to rapid surface water run-off and reduced attenuation of contaminated surface waters to watercourse.

These concerns have been responded to by Government implementing in September 1991 the Control of Pollution (Silage, Slurry and Agricultural Fuel Oil) Regulations 1991, which set down minimum standards for the design and construction of storage systems for these materials. It falls to the NRA to enforce these regulations. In addition the Ministry of Agriculture has produced a code of Good Agricultural Practice for the Protection of Water (COGAP), which provides practical advice on farm waste disposal and a whole range of other farming practices to minimise the risk of water pollution.

The NRA is also adapting other initiatives to reduce pollution from farms. These include:-

- (i) A systematic programme of farm visits to work with the farmer to identify and eliminate illegal point source discharges.
- (ii) Identification of Government 'Sensitive Areas' where restriction of certain agricultural practices is required e.g. Nitrate Sensitive Areas, Nitrate Vulnerable Zones.
- (iii) Full collaboration with MAFF, Welsh Office Agriculture Department, the National Farmers Union, the Farmers Union of Wales and other agricultural organisations to promote and establish an effective way forward for the prevention of farm pollution.

Recent pressure on farm profitability and the need for alternative sources of income is leading to an increasing range of Farm Diversification Schemes. Many are associated with leisure and tourism, often exploiting water resources, which is resulting in an additional range of concerns to the NRA.

Local Perspective

There are many hundreds of farms in the catchment. Sheep farming is widespread throughout the catchment but is increasingly dominant in the western uplands with altitude. Although sheep dipping is no longer compulsory, dipping or other veterinary insecticide treatments to prevent 'fly-strike' and sheep scab are widespread. The disposal of surplus dip is invariably by dilution and land spreading which requires careful control to avoid water pollution. Beef rearing often accompanies sheep farming where dairy or arable farming is not possible.

The main river valleys are dominated by dairy farming. Many farms are located close to rivers and streams, consequently careful siting and operation of slurry and silage storage and disposal systems is essential.

Arable farming covers only 17% of the catchment and is concentrated commercially to the north and east of the River Severn, elsewhere crops are mainly grown for on-farm use as feed.

Table 4 gives the full breakdown of land use from satellite data though it should be noted that just over 10% of the area was under cloud shadow and actual percentages may be greater.

Agriculture and the rural economy in general within the catchment has experienced a decline over the past decade. Around 95% of the catchment now benefits from recent designation by the European Commission as eligible for Objective 5b assistance. Farm development schemes and diversification into new opportunities eg. food processing enterprises, farm-related tourism etc. are therefore likely to increase during the next 5 years.

Map 11 is a classified LANDSAT image showing land use within the catchment.

The NRA liaises closely with local authorities to prevent pollution from dead animals. Carcasses found on the banks or in the river are removed without delay.

Objective The objective for this use is:

- * To ensure that farming practices are carried out in a way so as not to compromise the use of surface and groundwaters.

Environmental Requirements The requirements for this use are:

- Water Quality**
- * Minimum standards set down in the Control of Pollution (Silage, Slurry and Agricultural Fuel Oil) Regulations 1991 to be met.
 - * Farmers to be encouraged to follow the advice given in the Code of Good Agricultural Practice.
 - * The use of agrochemicals must not cause pollution of surface and groundwaters and sheep dip residues must be disposed of safely.

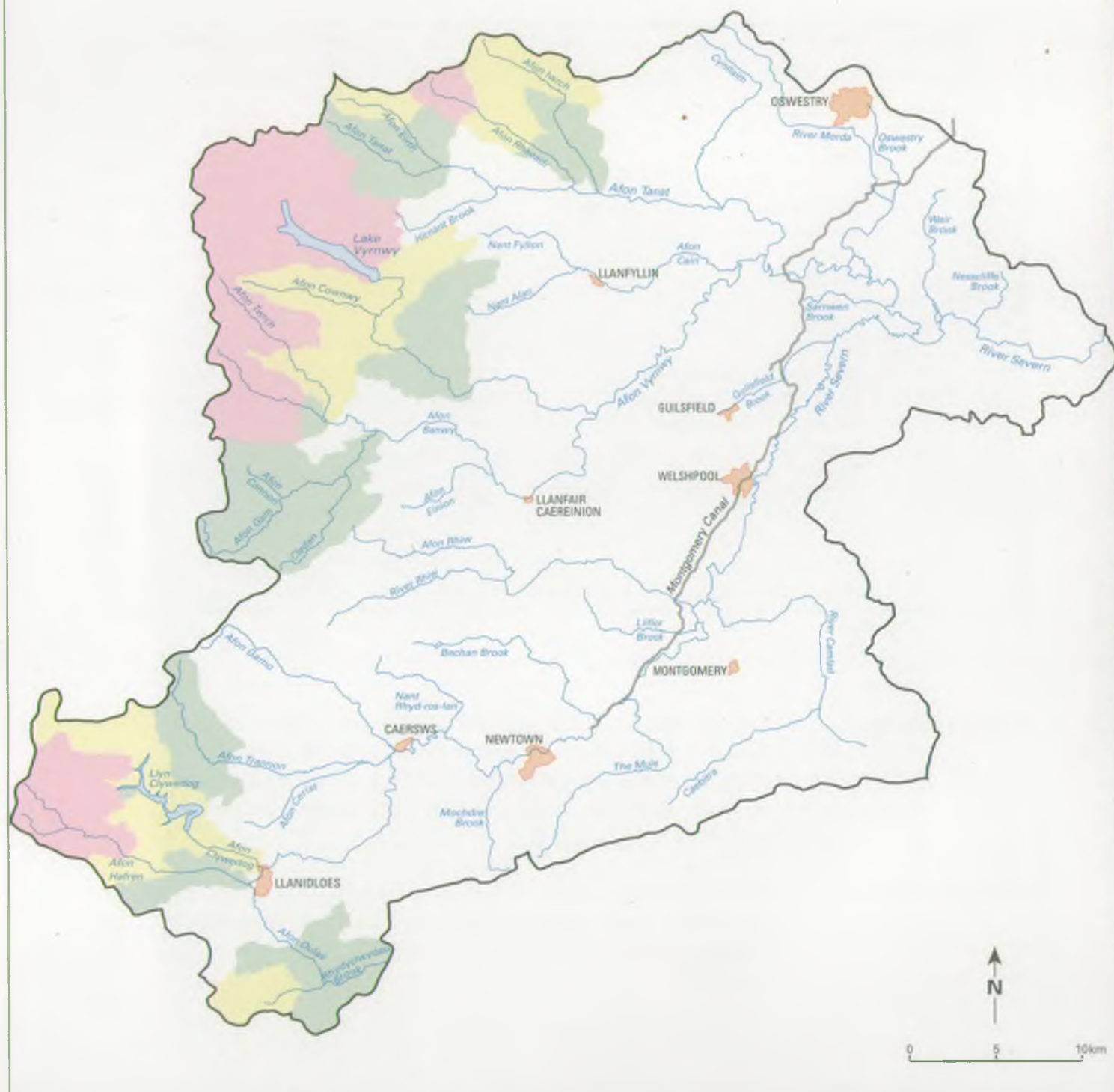
TABLE 4 - Catchment Land Use

Class	Legend	Area %	Cum %* Area	Area (km ²)
1	Wheat	0.96	0.96	19.83
2	Barley	1.66	2.62	34.35
3	Other Arable	1.98	4.60	40.81
4	Oil Seed Rape	5.77	10.37	119.14
5	Root Crops	5.66	16.03	116.84
6	Legumes	0.62	16.65	12.73
7	Grass	12.06	28.71	249.02
8	Fallow/Bare	3.29	32.00	68.04
9	Coniferous Woodland	8.46	40.46	174.79
10	Deciduous Woodland	1.35	41.81	27.78
11	Peat Bog	0.00	41.81	0.03
12	Moorland/Heather/Bracken	6.71	48.52	138.57
13	Upland Pasture/Rough Grass	33.05	81.57	682.56
14	Urbanised/Industrialised	7.81	89.38	161.36
15	Water	0.13	89.51	2.72
16	Cloud/Cloud Shadow	10.49	100.00	216.71
Total of 16 classes		100.00		2065.28

(Total Arable Classes 1-6 16.65%) *Cumulative

Water Quantity * The Authority will develop and implement a Regional abstraction licensing policy that will enable the effective management of water resources within the catchment. This will achieve the right balance between the needs of the environment, abstractors and the river users.

Physical Features * Land drainage to improve agriculture should not adversely affect the conservation value of rivers and habitats necessary for the fishery, or increase the risk of flooding.



KEY

- Catchment Boundary
 Canal

- Very high sensitivity - watercourse mean winter total hardness <10mg/l
- High sensitivity - watercourse mean winter total hardness 10 -15mg/l
- Medium sensitivity - watercourse mean winter total hardness 15 - 25mg/l

4.9 FORESTRY

General

The NRA recognizes that well managed forestry in appropriate areas can have minimal impacts on water and can benefit the overall environment. However, in certain circumstances conversion of land to forest and subsequent activities can have serious impacts on the water environment. Areas of concern to the NRA include:

- * Acidification of surface waters caused by the planting, harvesting and replanting of conifers on poorly buffered upland soils. The forest canopy scavenges sulphur and nitrogen pollutants from the atmosphere, and tree growth removes base cations from the soil.
- * Soil erosion due to forestry activities resulting in high suspended sediment loads and siltation of surface waters.
- * Reduced water yield in catchments because forests cause increased evapotranspiration.
- * Changes to the rate of runoff of surface water or obstructions to flood plains or watercourses with associated increase in flood risk.
- * Pollution of surface waters and groundwaters from the use of fertilizers and pesticides.
- * Effects on the habitat and conservation value of riparian and associated land.

To minimise these adverse effects the Forest Authority has published a series of Guidelines in respect of Water, Nature Conservation, Landscape Design and Recreation against which all grant aidable and licensed forest operations are assessed. The NRA is currently consulted on a non-statutory basis by the Forest Authority in respect of some applications under the Woodland Grant Scheme and Felling Licence requirements. The NRA intends to develop a more proactive approach to these guidelines and further develop "best land use practice" techniques.

Local Authorities produce Indicative Forest Strategies following guidance circulated by the Department of the Environment and Welsh Office (circulars 29/92 and 61/92 respectively). These map 'preferred planting areas' where adverse impacts are absent or minimal; 'potential planting areas' where damaging effects may be accommodated or ameliorated at some cost; and 'sensitive areas' where no or very limited planting is acceptable due to serious or costly impacts. The NRA intends to identify such areas in its Catchment Management Plans to enable it to advise Local Authorities and Forestry Authority accordingly.

The NRA intends to improve and develop the existing ad-hoc arrangements which exist with forest owners and managers, in particular Forest Enterprise, to discuss at local level management of forests and promote the whole forest design concept currently being used by Forest Enterprise.

Local Perspective

The forests most likely to have significant effects on the water environment are those on the Western headwater catchments, particularly those on base poor bedrock and soils. Streams here are highly important as salmonid nursery habitat and for a range of other fauna and flora. Potable water supply is important at Lake Vyrnwy and hydropower generation at Llyn Clywedog.

Sensitive catchments with existing plantations include:

- (i) River Severn upstream of Llanidloes.
- (ii) Afon Clywedog, Llyn Clywedog and feeders.
- (iii) Afon Banwy upstream of Llanerfyl.
- (iv) Afon Vyrnwy upstream of Dolanog, Lake Vyrnwy and feeders.
- (v) Afon Tanat and Afon Eirth upstream of Llangynog.

Other sensitive catchments not currently subject to existing extensive plantations are those of Afon Rhaeadr, Afon Iwrch and Afon Dulas. Map 12 shows Acid Sensitive areas, based on total water hardness.

Future new planting is expected to be on a small scale, often associated with farm diversification. Felling of mature stock and replanting is anticipated to substantially increase year on year over the next few years, and could have increased a hundred fold by the year 2000.

Objectives The objectives for this use are:

- * To ensure that forest activities do not cause pollution of surface and groundwaters or increase acidification or affect existing users and uses of water below forested areas.
- * To secure improved NRA links with Local Authorities on Structure and Local Plans, particularly in relation to Indicative Forest Strategies.
- * To secure improved NRA links with Forest Authority and forest owners and managers to recommend that forest management complies with Forest Authority Guidelines and that liaison with the NRA takes place wherever necessary.
- * To protect and enhance the conservation value of the water environment and associated land in connection with all forestry developments.
- * To ensure that forest activities do not create or exacerbate flooding problems.

Environmental Requirements The requirements for this use are:

- Water Quality** * New afforestation, felling and restocking and related activities to be restricted where they pose unacceptable risks to the quality of surface water or groundwater.
- Water Quantity** * New afforestation to be restricted where there are likely to be detrimental reductions in water yield or changes in the pattern of flows.
- Physical Features** *
- * Foresters to be encouraged to conserve and enhance wildlife and landscape features of water and riparian habitats.
 - * New afforestation, felling and restocking and related activities to be restricted where they pose unacceptable increase to flood risk.



Flood Warning Reaches

Extent of Flood Warning Reach

Urban Flood Alleviation Schemes

Flood Defence Improvement Schemes

4.10 FLOOD WATER CONVEYANCE AND STORAGE

General

The river network acts for the conveyance of surplus water from the land to the sea as part of the hydrological cycle.

Naturally cut watercourses have limited capacity; when this is exceeded flooding occurs. Normally flooding is a result of prolonged heavy rainfall or rapid snowmelt. The peak flow of a flood is described in terms of the frequency at which it is likely to be exceeded, which is usually expressed as a return period in years for example 1 in 50 years.

Floods flow onto the flood plain, which is as much a part of the river as the channel which carries normal flows. These natural flood plains of the river system provide 'on-line' storage of flood water. If significant areas of flood plain are embanked, tipped or built upon, the lost storage volume leads to higher river levels elsewhere. For this reason it is not possible to alleviate flooding in all areas.

In addition to in-channel structures there are many structures on the flood plain which affect flood flows. Roads, railways, embanked canals, and buildings all divert flood water to a greater or lesser degree as well as reducing the volume available for flood storage. As well as objecting to new development in flood risk areas, the NRA believes that 'redundant' structures should be removed from the flood plain. The flood plain is also an important habitat for plants and animals and is part of the 'river corridor'.

Flood defences are designed to protect an area against a flood of a particular return period. Different types of land use (for example urban and rural areas) are protected against different sizes of flood, with the target 'Standard of Service' detailed in Section 5.4 (Table 8).

In respect of Flood Defence the NRA has a supervisory role over all matters relating to water courses. It has direct powers of control over the construction or alteration of structures in, over, under or within 8 metres of those watercourses classed as main river, and over the construction or alteration of culverts, mill dams, weirs or other like obstructions in any watercourse.

Whilst the responsibility for the maintenance of any watercourse normally rests with the riparian owner (ie: the owner of the river bank and bed), certain reaches of the river are formally designated as "Main River". On main river, the NRA has permissive powers to construct and maintain defences and to control the actions of others through byelaws and the issue of Consents. District and County Councils have permissive powers to carry out works on Ordinary Watercourse (ie: those not designated as main river), and to make Byelaws, although even their work requires NRA consent.

Wider controls over the river system are achieved through the Town and Country Planning Acts (Section 4.1).

Local Perspective

The Severn and Vyrnwy valleys have extensive areas of flood plain, particularly in the vicinity of their confluence where approximately 50 square kilometres are used from time to time in this way.

This area provides natural storage for excess flood waters and helps to limit the flows passed further downstream. This impact on flows has been increased by the construction in the 18th century of low embankments (locally known as argaes). The argaes serve a dual purpose- providing limited protection for the land behind, and at times of higher flows retaining greater volumes of water in storage than would occur on a natural flood plain.

Flood defences have been constructed to provide protection to the communities at Caersws, Meifod and Newtown.

Other watercourses that have benefited from engineering works in the past for defence and drainage purposes include the Rivers Camlad, Cerist, Trannon and Morda.

In most locations flooding cannot be reduced and in others to do so would exacerbate problems elsewhere. Even where flood alleviation schemes exist, flooding is not prevented, only reduced. For these reasons a Flood Warning Scheme is in operation for the Rivers Severn and Vyrnwy to lessen the damage when floods occur. Warnings are issued by the NRA to the Police who disseminate the information, via the Flood Wardens to those in danger. Map 13 shows the warning reaches. Councils have powers to provide assistance to those at risk eg. provision of sandbags, evacuation etc. (refer Appendix 1).

Objectives The objectives for this use are:

- * To provide effective flood defences on main rivers for the protection of people and property to a standard appropriate to the land use. (The land use bands are described in Section 5.4 and Map 21).
- * To provide adequate flood forecasting and flood warning service and to respond to flood events.

CATCHMENT USES

- * To ensure where possible that the effectiveness of the flood plain to store and convey flood waters is not impaired.

Environmental Requirements Requirements for this use are:

- | | |
|--------------------------|---|
| Water Quality | * That increased run-off from new development, or any other works, does not increase the volume of water entering the draining watercourse to the extent that the ecology of the watercourse is detrimentally affected. |
| Water Quantity | * That run-off from new development does not affect aquifer recharge or support for base flows in local watercourses. |
| Physical Features | <ul style="list-style-type: none">* The flood plain to be kept free from development which creates additional flood risk.* Standards of protection to be maintained by the upkeep of flood defence schemes.* 'Main Rivers' to be maintained to ensure their flood carrying capacity is appropriate to the land use in the vicinity.* Environmental requirements to be taken into consideration when undertaking flood defence works. |



- EC Cyprinid
— EC Salmonid
— Non-designated Brown Trout Waters

4.11 FISHERIES ECOSYSTEM

General

The NRA has duties to maintain, improve and develop fisheries. Fish populations are affected by quality and quantity of water as well as by the availability of suitable physical habitat features. Fish are therefore important indicators of the overall health of the river.

The NRA is committed to the maintenance of breeding populations of salmonid and non salmonid fish, including the safeguarding of migration between the river and sea.

The NRA Severn-Trent Region has documented its Fisheries Strategies for all appropriate river reaches. It will use its legislative powers, under the Water Resources Act 1991 and the Salmon and Freshwater Act 1975, to ensure that the objectives for individual river reaches are achieved.

Local Perspective

Salmon

The Upper Severn and its tributaries are the principal salmon spawning and nursery areas for the Severn catchment. The main spawning grounds are in the River Severn from Welshpool to Llanidloes, River Vyrnwy from Llansantffraid to Dolanog, Afon Tanat, River Banwy, Afon Gam, Afon Rhiew, Afon Garno, Afon Trannon and Afon Dulas.

In common with other rivers throughout England and Wales, runs of salmon have declined in recent years. In particular there have been decreasing numbers of spring-run fish and an increasing trend towards late running grilse.

Many of the factors affecting the size of salmon runs occur at sea, those which may be of significance in freshwater include illegal fishing, changes in land use resulting in habitat deterioration, acidification and barriers to upstream migration to spawning grounds.

The NRA has a salmon hatchery facility at Llyn Clywedog which currently has a rearing capacity of 300,000 fed fry.

Trout

Many of the rivers in the catchment still contain thriving stocks of wild brown trout, particularly in the upper reaches of watercourses and in the small tributary streams such as the Afon Dulas, the Mule, Afon Garno and River Camlad. Declines of wild brown trout stocks have occurred in some rivers, however, such as the River Vyrnwy and the upper reaches of the River Severn.

CATCHMENT USES

The genetic integrity of native trout stocks has been diluted in rivers such as the Tanat and Severn by introductions of hatchery reared trout of diverse origin, and numbers of wild fish have decreased in some instances. Rainbow trout have also been introduced into the Tanat and Severn, and are known to breed in small numbers in the feeder streams of Llyn Clywedog and Lake Vyrnwy following many years of stocking in those waters. Both brown and rainbow trout are stocked into numerous other stillwaters in the catchment. Llyn Tarw near Newtown also contains a breeding population of American Brook Trout originally introduced into the lake in the early 1900s.

Coarse Fish

Coarse fish species including grayling, chub, dace and pike are common in the Severn as far upstream as Llanidloes and in the River Vyrnwy to Pont Robert. Barbel have spread up the River Severn to Penarth Weir near Newtown and are also present throughout the lower reaches of the Vyrnwy. The Montgomery Canal, an EC Designated cyprinid fishery, contains excellent populations of roach, tench, bream and pike together with some carp, perch and other coarse fish species. Coarse fish are present in a number of pools in the area, primarily in the lowland areas of the catchment.

Map 14 shows EC Designated and other important fisheries in the catchment

Objective The objective for this use is:

- * to sustain a natural fish population appropriate to the catchment.

Environmental Requirements The requirements for this use are:

- Water Quality**
- * River stretches designated for salmon and trout to comply with the standards specified in the EC Fisheries Directive (78/659/EEC) for salmonid fish.
 - * River and canal stretches designated for cyprinid fish to comply with the standards specified in the EC Fisheries Directive (78/659/EEC).
- Water Quantity**
- * Flows in the Afon Clywedog, River Severn and River Vyrnwy will be subject to the NRA's regulation control rules with appropriate safeguards to protect fisheries interests.
 - * The pattern of flows in other watercourses not to be altered from the natural variable pattern of flows, within the limitation of the Licensing Policy.

- Physical Features**
- * A variety of natural river features and habitats, to optimise the production of fish populations. This will include pools and riffles for feeding and spawning.
 - * Access to suitable streams for spawning. Artificial barriers should not obstruct passage of migratory fish.
 - * Appropriate levels of riparian and instream vegetation should be maintained to provide adequate cover for fish and habitats for other wildlife associated with the river and its corridor.
 - * River maintenance and other works should be carried out in a way that causes the least detrimental impact to the fishery or general ecosystem, and where possible should lead to enhanced habitat diversity.



KEY

- Catchment Boundary
- Canal

- Mixed Salmon, Trout and Coarse
- Trout Fishing
- Mixed Trout and Coarse Fishing
- Coarse Fishing
- Coarse Fishing Pool
- Trout Fishing Pool

4.12 ANGLING

General

This relates specifically to the use of the catchment by anglers.

Local Perspective

The catchment provides a variety of angling opportunities, with salmon, trout and coarse fisheries all well represented. Map 15 shows the main angling waters within the catchment.

Salmon fishing takes place principally at the Severn/Vyrnwy confluence, on the lower and middle reaches of the River Vyrnwy, and at Buttington, Welshpool and Abermule on the River Severn. Later in the season, catches are reported further upstream around Caersws on the Severn, Meifod on the Vyrnwy, and the lower reaches of the Rivers Banwy and Tanat. Catches have generally declined in recent years, particularly of spring-run fish, with an increasing tendency for salmon to run in late summer and autumn, often after the end of the fishing season.

Good fishing for wild brown trout is still widely available, particularly in the smaller tributary streams such as the Afon Dulas, River Mule, Afon Rhiew and River Camlad. Methods used include fly, worm and natural minnows. Many anglers, however, have abandoned this traditional style of fishing in favour of stillwater fisheries such as Llyn Clywedog, Lake Vyrnwy and Fownog Pool, which are artificially stocked with brown and rainbow trout. Elsewhere, some high quality river fishing is also maintained by stocking with hatchery reared brown trout, most notably the River Tanat and the River Severn at Caersws.

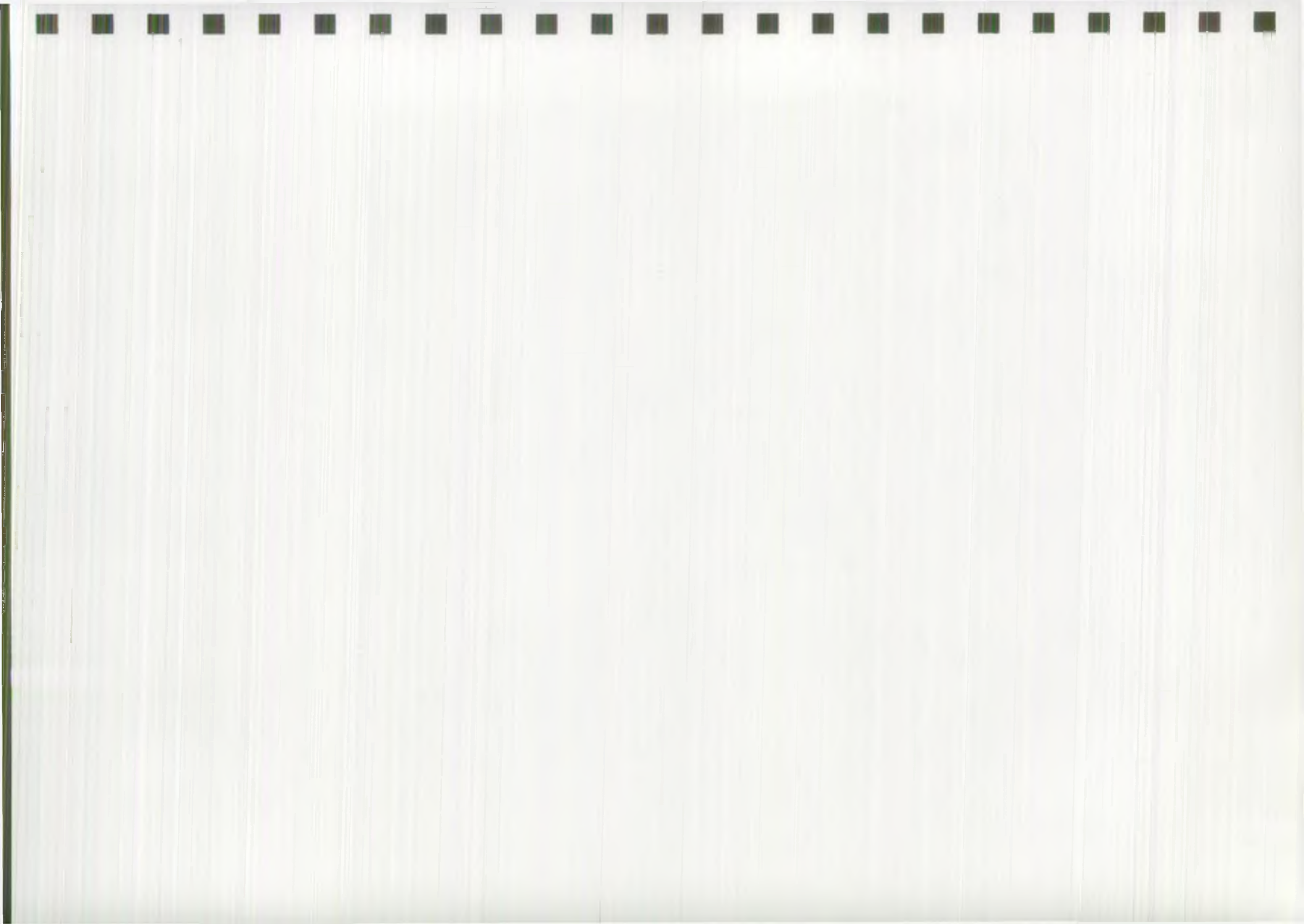
The Montgomery Branch of the Shropshire Union Canal is a high quality coarse fishery, providing some excellent tench and roach fishing, particularly early in the season. Chub and dace give fair sport in the River Severn up to Newtown, and in the River Vyrnwy to Meifod. Barbel are featuring increasingly in catches in both the Severn and the Vyrnwy as this species continues to extend its range. Grayling catches have declined in some rivers, particularly the Tanat, but stocks are now showing signs of recovery with some good bags being reported from many areas in the late summer and autumn. Stillwater coarse fisheries are rather scarce in the catchment, the only notable day ticket water being Llynclys Pool near Oswestry.

Objectives The objectives for this use are:

- * To provide suitable and safe conditions for successful angling.
- * To improve angling by implementing measures to increase fish stocks.

Environmental Requirements The requirements for this use are:

- | | |
|--------------------------|--|
| Water Quality | <ul style="list-style-type: none"> * River stretches designated for salmon and trout to comply with the standards specified in the EC Fisheries Directive (78/659/EEC) for salmonid fish. * River and canal stretches designated for cyprinid fish to comply with the standards specified in the EC Fisheries Directive (78/659/EEC). * Compliance with the basic amenity quality standards. * Water to be free from surface films and extraneous floating material, discolouration and unpleasant odours. |
| Water Quantity | <ul style="list-style-type: none"> * Flows in the Afon Clywedog, River Severn and River Vyrnwy to be subject to the NRA's regulation control rules with appropriate safeguards to protect fisheries interests. * The pattern of flows in other watercourses not to be altered from the natural variable pattern of flows, within the limitation of the Licensing Policy. |
| Physical Features | <ul style="list-style-type: none"> * A variety of natural river features and habitats, to optimise the production of fish populations. * Appropriate levels of riparian and instream vegetation should be maintained to provide adequate shade and cover for fish. * River works to cause minimum damage to the fishery and improve the diversity of river habitats where practicable. * Suitable physical access points and habitats should be maintained for angling. |





KEY

- | | | | |
|--|----------------------------|--|---|
| | Catchment Boundary | | Water Based SSSI |
| | Canal | | Other SSSI |
| | Open water length of canal | | Water Based Prime Sites for Nature Conservation |

4.13 CONSERVATION - ECOLOGY

General

The NRA, whilst carrying out its functions or dealing with proposals by others, has a duty under the Water Resources Act 1991 to promote and further the conservation of flora and fauna. The Wildlife and Countryside Act 1981 protects a wide range of plants and animals.

This use deals with:

- * the protection and, where appropriate, enhancement of flora and fauna which may be entirely or only partially dependent on the water environment.
- * the protection of areas formally designated as being of particularly high conservation value, including National Nature Reserves and Sites of Special Scientific Interest (SSSIs).
- * the protection of sites which, although valuable in ecological terms, are not formally protected, eg other nature reserves and Prime Sites for nature conservation.

The NRA Severn-Trent Region has produced a draft Conservation Strategy for all the main rivers within the catchment and will use its legislative powers to ensure that the objectives for individual river reaches are achieved.

Local Perspective

Topography

The Upper Severn and its major tributaries demonstrate the classic pattern of a river's geomorphological development. Starting from open moorland on upland plateaux, the rivers drop through steep sided, often wooded gorges, which frequently support important mosses and lichens; to the lower stretches of embanked river flood plain surrounded by land improved for agriculture. Many of these rivers have a largely natural regime with diverse habitats, are relatively free from pollution and support a variety of species which reflect the various types of river bed, flow and water quality along the river courses.

The River Severn from Dolwen to Penstrowed is a proposed geomorphological SSSI of high conservation value because of its actively eroding, braided, meandering channel. These features are particularly susceptible to damage from development and from unconsented river works carried out by landowners in response to a loss of agricultural land resulting from this erosion. Erosion by rivers has also been responsible for exposing geological features including fossils and a variety of rock formations at Gwern Y Brain dingle and Bron Y Buckley woods.

CATCHMENT USES

Land Use	Although the ecological value of the water environment within the catchment is still relatively high, degradation has occurred through post war land drainage and agricultural improvements, grazing, coniferous afforestation in the uplands and urban development. The recent development of wind farms may also threaten some remnant wetland habitats in upland areas.
Habitat Types	There are 77 designated SSSIs and a National Nature Reserve on the Berwyns within the catchment. Of these, 49 are associated with watercourses or wetlands, and include blanket, basin and valley mires, wet woodland, carr woodland, lakes, damp pasture, open water grading into fen and lengths of the Montgomery Canal. There are also 42 water related Prime Sites for nature conservation and a RSPB reserve at Lake Vyrnwy. Map 16 shows SSSIs and water related Prime Sites within the catchment.
Canals	The Montgomery Canal exhibits an exceptionally rich aquatic flora which includes floating water-plantain, autumnal water-starwort and 11 species of pondweeds. Restoration of the canal is likely to result in the loss of some of the plant species.
Otters	Despite a national decline of the otter population in the 1960s and 1970s, the upper Severn catchment has remained a stronghold for otters which are now extending their range into other areas where populations had previously been lost. Mink are also widespread within the catchment and are often regarded as a pest species. Attempts to control their numbers by hunting may adversely affect otters which are particularly susceptible to disturbance.
Birds	<p>A number of locally and nationally important bird species associated with wetlands exist within the catchment, most notably kingfisher, little ringed plover and dipper. Wading birds such as lapwing, curlew, snipe and redshank have shown recent declines because of wetland habitat loss and changes in farming practices. This is particularly evident in the extensive flood plain area around the Severn/Vyrnwy confluence where populations of waders and wildfowl have decreased in recent years. New wetlands have been successfully created at Dolydd Hafren and Welshpool to help counteract this trend.</p> <p>Goosanders have colonised the catchment in recent years and their presence, together with cormorants and herons, has led to anglers and fishery owners expressing concern about their impact on fish stocks.</p>
Invertebrates	Most rivers in the catchment support a high quality and varied range of invertebrates, except in acidified streams such as the Afon Twrch and the top end of the River Severn, and in the Afon Cerist which is contaminated with heavy metals from the old Fan lead mine. Native crayfish within the catchment are under threat from plague introduced via

CATCHMENT USES

farm-reared alien crayfish species, with a serious outbreak of disease reported on the River Camlad in recent years.

Objective The objective for this use is:

- * to promote and further the conservation interests of the water environment and to safeguard the conservation interests of designated sites.

Environmental Requirements The requirements for this are:

Water Quality * Relevant surface water (ie rivers, streams, lakes and ponds) to comply with the standards for amenity protection and other site specific criteria.

- * Where water quality is a key factor it should comply with the appropriate River Ecosystem class.

Water Quantity * Flows in the Afon Clywedog, River Severn and River Vyrnwy will be subject to the NRA's regulation control rules with appropriate safeguards to protect conservation interests.

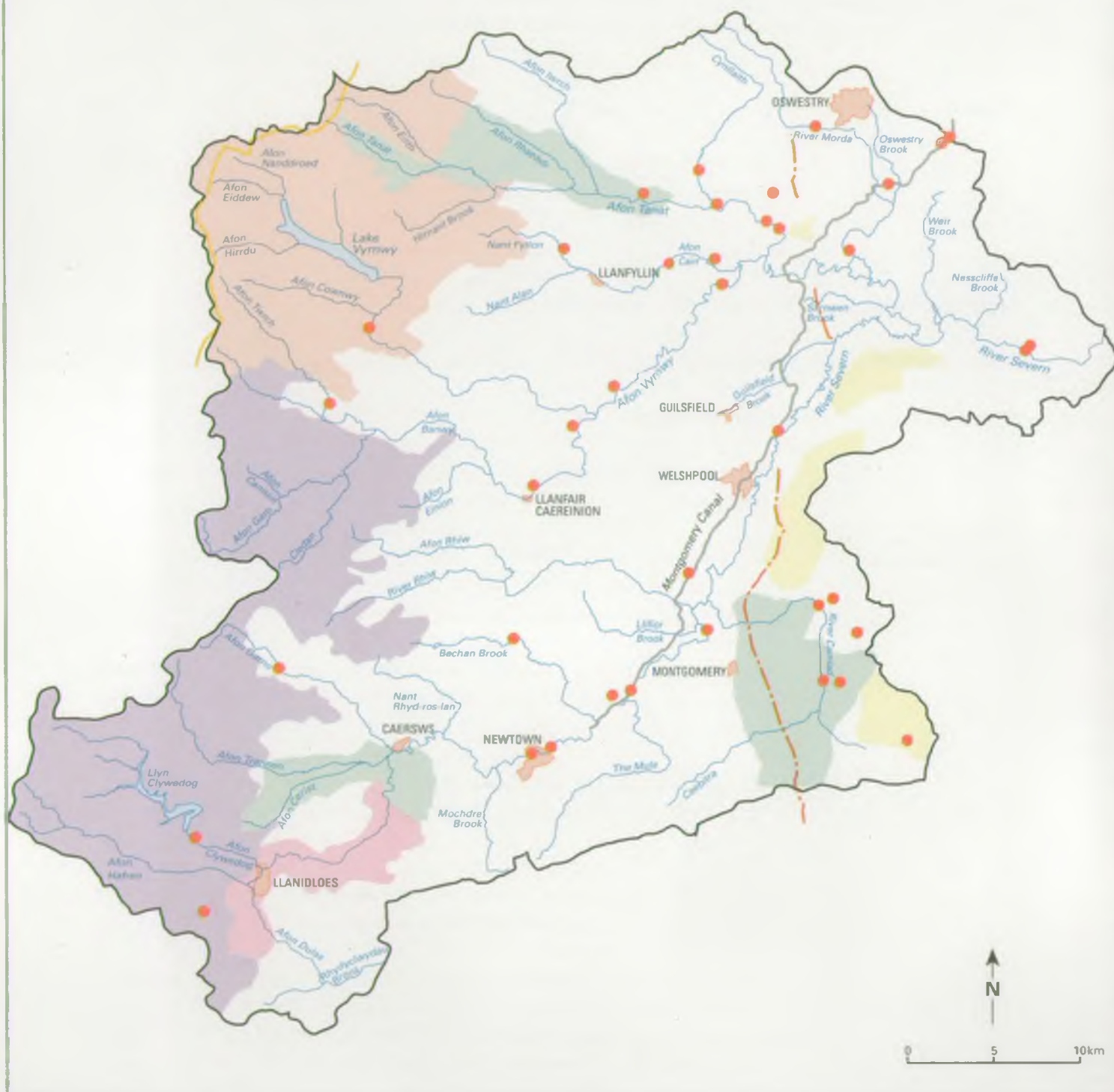
- * The pattern of flows in other watercourses not to be altered from the natural variable pattern of flows, within the limitation of the Licensing Policy.

- * Groundwater levels not to be artificially lowered where it is likely to adversely affect flora and fauna dependent on those water levels.

Physical Features * The variety of natural river features (such as meanders, pool and riffle sequences and the presence of aquatic vegetation) to be maintained and enhanced where possible.

- * A variety of river corridor and other wetland habitats (including marsh, fringe and overhanging vegetation, bankside trees and hedges and wetland meadows) to be maintained and enhanced where possible. Designated conservation areas are to be protected.

- * NRA river maintenance operations and consented land drainage works to cause minimal damage to the flora and fauna of the river corridor and enhance them where possible.



KEY

- Catchment Boundary
- Canal
- - - Offa's Dyke(Scheduled Section)
- National Park Boundary
- Scheduled Ancient Monument associated with Water Environment

- Historic Landscape Areas
- Special Landscape Areas
 - Berwyn Mountains including Tanat Valley and Lake Vyrnwy
 - Western Uplands
 - Isolated Border Hills
 - Upper Severn Valley

4.14 CONSERVATION - LANDSCAPE , ARCHAEOLOGY AND HERITAGE

General

The NRA has a duty to conserve and enhance landscape, archaeological, architectural and historic features which are affected by the operations it consents and licences, or by its own operations.

This use deals with:

- * the protection of areas formally designated as being of value, eg National Parks, Areas of Outstanding Natural Beauty, and Scheduled Ancient Monuments
- * the protection of areas which, although valuable in landscape, archaeological or historical terms are not formally protected

Local Perspective

The catchment is not formally designated as being of landscape value, with the exception of a small area of the Berwyn Mountains which falls within the Snowdonia National Park. There are a variety of landscape types within the catchment, each of which contributes to its character and distinctiveness so that the landscape quality of the catchment is uniformly high. The upper Severn valley, the western uplands of Montgomeryshire, the Berwyn Mountains including the Tanat valley and Lake Vyrnwy, and the border hills to the east of the area have been designated as Special Landscape Areas in the Powys Structure Plan. Map 17 shows the landscape areas within the catchment.

Of the 263 Scheduled Ancient Monuments within the catchment, only a small number may be affected by river activities. However, a few are situated close to watercourses or are conspicuously located on flood plains, eg Meverley Church and several bridges (see Map 17). Offa's Dyke is an important feature of the catchment area which in some locations runs along the tops of the argaes (flood protection banks) in the Severn/Vyrnwy confluence area. The argaes date back to the early 1700s and although not listed, are features of historical interest in their own right.

CATCHMENT USES

Cadw and the Countryside Council for Wales are presently compiling a register of historic landscapes in Wales and parts of the catchment have been identified as areas of Special Historic Landscape. These areas include the Caersws/Llandinam/Llanidloes basin, the Montgomery basin, extensive parts of the Tanat valley and the Berwyn range, most of which are associated with watercourses, emphasising the importance of rivers in the past. This is a new non-statutory designation which aims to provide information on historic landscapes, to aid their protection and conservation.

Objective The objective for this use is:

- * to protect the landscape, archaeological, architectural and historical features associated with rivers in the catchment and to safeguard designated sites and, where appropriate, access to these sites.

Environmental Requirements Requirements for this use are:

Water Quality * It is difficult to specify water quality requirements to protect landscape or heritage sites. However, the NRA is aware that buried archaeological features may be affected by water quality, especially increased acidification.

Water Quantity * Flows in the Afon Clywedog, River Severn and River Vyrnwy will be subject to the NRA's river regulation control rules with appropriate safeguards to conservation interests.

- * The pattern of flows in other watercourses not to be altered from the natural variable pattern of flows, within the limitation of the Licensing Policy.

- * Groundwater levels should not be reduced at archaeological sites which are dependent on a stable ground water level.

Physical Features * The diversity of river and wetland habitats which contribute towards the landscape value of the catchment should be preserved and enhanced wherever possible.

- * Traditional countryside management techniques should be continued and encouraged.

- * River works should not adversely affect sites of landscape importance or sites of archaeological, architectural and historical interest.

4.15 AMENITY AND RECREATION

General

This use deals with those recreational activities that are principally land based but occur within the proximity of the river corridor or wetlands. Examples include camping and caravanning, walking, picnicking, and birdwatching. The main areas of concern are access, public safety and the general aesthetic acceptability of the water environment.

Local Perspective

Although many people live adjacent to watercourses in the catchment, it is unlikely they are utilised by local inhabitants to their full potential, with use of the few existing footpaths mostly confined to dog walking. There are a number of camping and caravan sites on riverside locations where more informal use of the rivers takes place. Map 18 shows registered caravan sites for 20 pitches and over, and illustrates the predominance of riverside locations.

Areas most frequented by the public are Clywedog and Vyrnwy reservoirs and the Hafren Forest, where access for the disabled is provided. Sections of Offa's Dyke long distance path run along the flood embankments at the Severn/Vyrnwy confluence, and Glyndwr's Way follows part of the Severn around Llanidloes and Clywedog. There are well used footpaths alongside the Montgomery Canal and further restoration of the canal will improve this resource. The marina alongside the Canal Basin in Welshpool has been developed and is used as an amenity area. Additional marinas are planned together with further canalside facilities.

The RSPB reserve at Lake Vyrnwy, which also has an information centre, is popular with local people, tourists and ornithologists. The opening of the Dolydd Hafren nature reserve to Montgomeryshire Wildlife Trust members and Coed Y Dinas lake near Welshpool, will provide additional access for birdwatching. Main amenity and recreation sites are shown on Map 19.

Tourism development, as highlighted in the recent report Tourism 2000 (Welsh Tourist Board), is set to increase within the catchment. Providing such developments are sympathetically designed and meet the necessary standards, the water environment should be safeguarded.

Objectives The objectives for this use are:

- * to maintain water quality to prevent any public nuisance arising from visual and odour problems

CATCHMENT USES

- * to provide safe, environmentally sensitive and easy access to watercourses, including facilities for the disabled, without unreasonably constraining other users.
- * to maintain and promote amenity features associated with water courses

Environmental Requirements Requirements for this use are:

Water Quality * Water should be free from surface film, discolouration, extraneous floating material and unpleasant odour.

Water Quantity * Flows in the Afon Clywedog, River Severn and River Vyrnwy will be subject to the NRA's river regulation control rules.




* The pattern of flows in other watercourses should not be altered from the natural variable pattern of flows, within the limitation of the Licensing Policy.

Physical Features * Riverside paths and access points should be maintained, and further development promoted where appropriate.

* The development of informal recreational sites at suitable locations should be promoted in collaboration with other bodies as opportunities arise.



KEY

-  Catchment Boundary
 Canal
 Caravan Sites > 20 Pitches



KEY

- Catchment Boundary
- Canal

- Long Distance Footpath
- Open water lengths of Canal
- Navigable reaches of River Severn
- Upstream limit of Public Navigation
- S Sailing Facilities
- C Canoeing
- hiker icon Forest Walks/Nature Trails
- bird icon RSPB Reserve

4.16 BOATING, NAVIGATION AND WATERSPORTS

General

This use deals with :

- * regulation of the use of waterways for navigation
- * watersports, which in this catchment are mostly confined to canoeing, dinghy sailing and windsurfing

The NRA does not encourage swimming in rivers and lakes because of the risk of drowning and the possibility of swimmers catching water borne diseases.

Local Perspective

The River Severn has been used for navigation for many centuries and there is deemed to be a common law right of free navigation on the river from Pool Quay downstream to Stourport, although this has not been tested in a court of law. The NRA is not the navigation authority for any part of the River Severn.

Boating activity on rivers in the catchment is concentrated on canoeing on the River Severn, with limited use of the River Vyrnwy for which permission needs to be sought from landowners before canoeing can take place. Access can cause conflict between canoeists, landowners and other users but is not currently a major problem. Canoeists occasionally take advantage of releases of water from Llyn Clywedog and Lake Vyrnwy. Boating and navigation sites are shown on Map 19.

Other non-motorised water sports such as dinghy sailing and windsurfing take place within the catchment, and are popular at Llyn Clywedog. An outdoor centre uses Lake Vyrnwy for canoeing. Anglers use boats on both lakes. The restoration of the Montgomery Canal will increase boating activity within the catchment. Unauthorised use of jet skis occasionally takes place on various water bodies.

Objectives - The objectives for this use are:

- * to safeguard the quality and quantity of the water sufficient for this use.
- * to ensure that works on river channels do not prejudice these activities as far as is practicable and where appropriate, take opportunities to enhance recreational facilities.

CATCHMENT USES

- * to promote recreational use of the water for boating and canoeing commensurate with the interests of other users.
- * to raise public awareness of the dangers of Weil's disease.

Environmental Requirements Requirements for this use are:

- Water Quality**
- * There are no quality standards or classification schemes which specifically cover the health risks associated with water sports at present. In the absence of standards, water should be free from surface films, and extraneous floating material, discolouration and unpleasant odour.
- Water Quantity**
- * Flows in the Afon Clywedog, River Severn and River Vyrnwy will be subject to the NRA's river regulation control rules.
 - * The pattern of flows in other watercourses not to be altered from the natural variable pattern of flows, within the limitation of the Licensing Policy.
- Physical Features**
- * Controlled access for boating and watersports should be maintained.
 - * Formalised sites for launching and retrieving canoes should be promoted.

SECTION 5.0 CATCHMENT TARGETS

This section outlines the targets in the catchment for Water Quality, Water Quality and Physical Features. The targets will then be compared with the current state of the catchment to identify areas where there is a shortfall against the target.

Map 20



- | | |
|---|---------|
| | Class 1 |
|  | Class 2 |
|  | Class 3 |
| | Class 4 |
| | Class 5 |

5.1 SURFACE WATER QUALITY TARGETS

River Quality Objectives

The NRA uses two major schemes for the reporting of river water quality: the General Quality Assessment (GQA) scheme, which is used to make periodic assessments of the water quality; and the statutory water quality objectives (WQOs) scheme, which is used for the setting of water quality planning targets. These new schemes have replaced the National Water Council (NWC) scheme, upon which previous references to water quality have been based.

The WQO scheme establishes clear quality targets in Controlled Waters, on a statutory basis, to provide a commonly-agreed planning framework for regulatory bodies and dischargers alike. The proposed WQO scheme is based upon the recognised uses to which a river stretch may be put. These uses include: River Ecosystem; Special Ecosystem; Abstraction for Potable Supply; Agricultural/Industrial Abstraction; and Watersports. The first phase of WQO implementation will be restricted to the River Ecosystem Use only. (Standards for the River Ecosystem Use were introduced by *The Surface Waters (River Ecosystem) (Classification) Regulations 1994*; standards for further uses are still under development). For each stretch, a target River Ecosystem (RE) use class will be proposed, including a date by which this level of water quality should be achieved. There are five classes within the RE scheme, one of which will be applicable to almost every stretch of classified river. The term 'Ecosystem' is used in recognition of the need to protect the ecosystem that is sustained in a healthy river. The proposed standards for River Ecosystem use classes are based on the chemical water quality requirements of different types of ecosystem. Until WQOs are formally established by legal Notice, they will be applied on a non-statutory basis by translation of River Quality Objectives (RQOs) from NWC grades to appropriate River Ecosystem classes and target dates.

WQOs are established for lengths of river (river stretches) which share the same quality target. River stretches are defined according to their upstream and downstream limits; a target River Ecosystem class is applied, together with a date for its achievement. Physical features such as tributaries, weirs, or significant discharges often mark the ends of river stretches owing to their potential significant effects on water quality.

Details of the WQOs assigned to river stretches, compliance with WQOs including the monitoring data upon which compliance assessment is based will be included on the Public Register.

Table 5 describes the Water Quality Criteria of the River Ecosystem classification.

Water Quality within each River Ecosystem class can be described as:-

Class RE 1: Water of very good quality (suitable for all fish species).

Class RE 2: Water of good quality (suitable for all fish species).

CATCHMENT TARGETS

Class RE 3: Water of fair quality (suitable for high class coarse fish populations).

Class RE 4: Water of fair quality (suitable for coarse fish populations).

Class RE 5: Water of poor quality (which is likely to limit coarse fish populations).

Unclassified: Water of bad quality (in which fish are unlikely to be present), or insufficient data available by which to classify water quality.

EC Directives also apply to the quality of surface water for potable (drinking water) abstraction, to support fish life and to control the discharges of dangerous substances. These are summarised in Table 6.

Local Perspective

Table 7 identifies the river stretches covered by this catchment management plan and describes their current objective class for the plan period and longer-term class objective.

The stretches marked by an asterisk (*) in Table 7 require work to be undertaken or completed in order to achieve their class objective within this plan period. Details are provided in Section 3, Issue 3.

The downstream stretch of the Afon Vyrnwy which is predicted to achieve Class RE2 requires investigation to identify the causes contributing to this reduction in quality from the upstream stretches. An action plan will then be forwarded into the next CMP.

Overall Target

Map 20 shows the River Ecosystem class objectives for this Catchment Management Plan.

CATCHMENT TARGETS

Table 5 - River Ecosystem Classification : Water Quality Criteria

Class	Dissolved Oxygen % saturation 10 percentile	BOD (ATU) mg/l 90 percentile	Total Ammonia mg N/l 90 percentile	Un-ionised Ammonia mg N/l 95 percentile	pH lower limit as 5 percentile; upper limit as 95 percentile	Hardness mg/l Ca CO ₃	Dissolved Copper µg/l 95 percentile	Total Zinc µg/l 95 percentile
RE1	80	2.5	0.25	0.021	6.0 - 9.0	≤10 >10 and ≤50 >50 and ≤100 >100	5 22 40 112	30 200 300 500
RE2	70	4.0	0.6	0.021	6.0 - 9.0	≤10 >10 and ≤50 >50 and ≤100 >100	5 22 40 112	30 200 300 500
RE3	60	6.0	1.3	0.021	6.0 - 9.0	≤10 >10 and ≤50 >50 and ≤100 >100	5 22 40 112	300 700 1000 2000
RE4	50	8.0	2.5	-	6.0 - 9.0	≤10 >10 and ≤50 >50 and ≤100 >100	5 22 40 112	300 700 1000 2000
RE5	20	15.0	9.0	-	-	-	-	-

Table 6 - Summary of EC Directives

EC DIRECTIVE	STATUTORY INSTRUMENT	RELEVANT CLASSIFICATION	APPLIES TO
1. Surface Water Abstracted for Drinking Water, 75/440/EEC	Surface Waters (Classification) Regulations 1989, SI 1989/1148	DW1, DW2 and DW3	Designated abstraction points
2. Quality of Freshwater to Support Fish Life 78/659/EEC	(Regulations being prepared)	Separate Classes for Salmonid and Cyprinid Waters	Designated stretches of water
3. Dangerous Substances legislation arising from 76/464/EEC	Surface Waters (Dangerous Substances) (Classification) Regulations 1989 and 1992, SIs 1989/2286 and 1992/337	DS1, DS2 and DS3 Classifications for List II substances in Circular 7/89	All waters receiving discharges of these substances-

CATCHMENT TARGETS

Table 7 River Ecosystem Water Quality Class Objectives

RIVER	UPSTREAM BOUNDARY	DOWNSTREAM BOUNDARY	REACH	CMP CLASS	LONGER TERM CLASS
			LENGTH	OBJECTIVE (YR)	OBJECTIVE
R SEVERN	CWM RICKET FORD	CONF. A. CLYWEDOG	11.5	1	1
	CONF. A. CLYWEDOG	CONF. A. CERIST	14.5	1	1
	CONF. A. CERIST	CONF. MOCHDRE BK	12.3	1	1
	CONF. MOCHDRE BK	NEWTOWN WRW DISCHARGE	7.4	1	1
	NEWTOWN WRW DISCHARGE	CONF. MULE	3.5	2	1
	CONF. MULE	WELSHPOOL WRW DISCHARGE	20.3	1	1
	WELSHPOOL WRW DISCHARGE	CONF. A. VYRNWY	25	1	1
	CONF. A. VYRNWY	CONF. R. PERRY	18.5	1	1
A. DULAS	TYLWCH	CONF. R. SEVERN	5	1	1
A. CLYWEDOG	LAKE CLYWEDOG DAM	CONF. R. SEVERN	5.3	1	1
A. CERIST	VAN	CONF. A. TRANNON	7.5	3 (2000)	3
	CONF. A. TRANNON	CONF. R. SEVERN	1.5	1 (2000)	1
A. TRANNON	LLAWRYGLYN FORD	CONF. AFON. CERIST	8.5	1	1
A. GARNO	CONF. A. CLEDAN	CONF. R. SEVERN	10	1	1
BECHAN BK	GWGIA POOL OUTLET	CONF. R. SEVERN	10.5	2	2
THE MULE	A489 GILFACH BR, KERRY	CONF. R. SEVERN	11	1	1
A. RHIW	SOUTH; NANT-Y-LLYN	CONF. NORTH ARM	7.4	1	1
	NORTH; LLETTY-GWILYM	BERRIEW WRW DISCHARGE	20	1	1
	BERRIEW WRW DISCHARGE	CONF. R. SEVERN	1	1	1
CAMLAD	CONF. CAEBITRA BK	CONF. R. SEVERN	23.2	1	1
GUILSFIELD BK NEW CUT	GUILSFIELD MILL FORD	CONF. R. SEVERN	9.8	2	2
A. VYRNWY	LAKE VYRNWY DAM	CONF. A. COWNWY	4.5	1	1
	CONF. A. CONWY	CONF. A. BANWY	18.9	1	1
	CONF. A. BANWY	CONF. A. TANAT	20.3	1	1
	CONF. A. TANAT	CONF. R. SEVERN	21.9	2	1
A. CONWY	BRYN COWNWY	CONF. A. VYRNWY	1.5	1	1
A. BANWY	CONF. NANT YSGUTHAN	CONF. A. EINION	17	1	1
	CONF. A. EINION	CONF. A. VYRNWY	12.5	1	1
A. TWRCH	NANT-YR-HELYG BR	CONF. A. VYRNWY	7.5	1	1
A. GAM	CWM DERWEN FORD	CONF. A. BANWY	9	1	1
A. CAIN	RD BR LLANPYLLIN	CONF. BROGAN	7	1	1
	CONF. BROGAN	CONF. A. VYRNWY	4	1	1
A. TANAT	CONF. A. ERITH	CONF. IWRCH	11.1	1	1
	CONF. IWRCH	CONF. AFON VYRNWY	16.3	1	1
A. IWRCH	PONT MAEN GWYNEDD	CONF. TANAT	7	1	1

CATCHMENT TARGETS

Table 7 (continued)

RIVER	UPSTREAM BOUNDARY	DOWNSTREAM BOUNDARY	REACH	CMP CLASS	LONGER TERM CLASS
			LENGTH	OBJECTIVE	OBJECTIVE
CYNLLAITH	PEN-Y-GWELLY RES DAM	CONF. TANAT	12	1	1
A. RHAEADR	PISTYLL RHAEADR	CONF. A. TANAT	8	1	1
R. MORDA	TYN-Y-COED BR	NWW WTW DISCHARGE	4	1	1
	NWW WTW DISCHARGE	OSWESTRY MILE OAK WRW	1.5	1	1
	OSWESTRY MILE OAK WRW	NEWBRIDGE *	1.6	3(2000)	2
	NEWBRIDGE	CONF. OSWESTRY BK	2.9	2	2
	CONF. OSWESTRY BK	CONF. A. VYRNWY	6.1	2	2
SARNWEN BK	SOURCE	CONF. A VYRNWY	5.5	2	2
WEIR BK	FT BR AT WEIR BK	CONF. R. SEVERN	9.2	2	2
MONTGOMERY	A5 RD BRIDGE	MORTON FARM MORTON *	5	3 (2000)	2
CANAL	PANT-PLAS CERRIG	WERN O/F	10	2 (1997)	2
	WERN O/F	WELSHPOOL MARINA	8	2	2
	WELSHPOOL MARINA	B4389 RD BR ABERBECHAN	17.5	2	2

* Stretches which require work to achieve CMP objective.

5.2 GROUNDWATER PROTECTION TARGETS

General

The NRA's 'Policy and Practice for the Protection of Groundwater' (PPPG) provides advice on the management and protection of groundwater on a sustainable basis. This new policy deals with the concepts of vulnerability and risk to groundwater from a range of human activities. It considers both source and resource protection, i.e. protection for the area which drains to the abstraction point (source) and protection for the total area of the aquifer irrespective of abstractions (resource).

It deals in particular with:

- * control of groundwater abstractions
- * physical disturbance of aquifers and groundwater flow
- * discharges to underground strata
- * waste disposal to land
- * disposal of slurries and sludge to land
- * contaminated land
- * diffuse pollution
- * unacceptable activities in high risk areas

The implementation of the policy relies in part on the construction of a series of maps. The maps to be produced are to reflect the groundwater vulnerability (resource protection).

The policy recognises three groundwater source protection zones, which are currently being defined. These are:-

Zone I (Inner Source Protection): Immediately adjacent to the source area defined by a 50 day travel time from any point below the water table to the source (based on biological contaminant decay).

Zone II (Outer Source Protection): Area defined by 400 day travel time (based on the delay and attenuation of slowly degrading pollutants).

Zone III (Source Catchment): The complete catchment area of groundwater source. The controls to be exerted on a given activity will be more stringent the more vulnerable the resource and the nearer the source.

CATCHMENT TARGETS

Resource Capacity

The NRA's Severn-Trent Region categorises areas of groundwater (aquifers) on the basis of policy towards further development of groundwater resources. The classification is:-

- A: No resources available.
- B: Special study needed and presumption against large licences
- C: Special study - no presumption
- D: Resources available

Local Perspective

The national framework policy for the protection of groundwater will manage groundwater protection effectively in this catchment. Groundwater resources are generally very limited throughout the catchment, with the Permo-Triassic Sandstones in the north east being the primary aquifer.

A Groundwater Vulnerability map has been produced after considering how vulnerable groundwater is to pollution, based on the nature of the strata and type of soil and drift cover (refer Map 24).

The Region has maps delineating the position of major potable groundwater abstractions and an indication of the groundwater vulnerability. These are being used until the new maps are available and can be obtained from our Regional Office at Solihull. For internal purposes to assist in the assessment of risk to major groundwater sources from specific development proposals, sensitive areas are drawn around abstractions. However, these zones are not true reflections of the source catchments.

These existing zones are used in the consideration of proposals that could pose a risk to a particular source. Refinement of a zone would be undertaken if more detailed hydrogeological information became available. Developers in connection with specific proposals may submit appropriate data which will be considered by the NRA for the modification of the existing zone.

5.3 WATER QUANTITY TARGETS

General

There are four main use types which can affect the natural flow regime of a river. These are:-

- * Abstractions
- * Discharges
- * Reservoirs and Impoundments
- * Land Use Changes

Abstractions can reduce the quantity of water in rivers and streams. Discharges generally increase the flow. Reservoirs and impoundments affect flow and levels in a more complex manner. Where an impoundment is used for water power, for example, a head may be built up to generate electricity over a short period. This has the effect of cutting down the flow in the river while the reservoir fills, then increasing flow during generation.

Abstraction licences have been issued since 1965. Initially, 'licences of right' were issued to anyone who had been abstracting during the previous five years. Conditions could not be imposed on those licences, but since then, applications to abstract have been determined on an individual basis and conditions imposed to protect the environment and other abstractors' rights.

However, assessment of how much water may be abstracted without adversely affecting the environment is difficult. The NRA is therefore undertaking a number of research projects to help our understanding. It will be several years before answers are available, but when concluded, we will be better able to set flow targets throughout the catchment.

Surface water flows to watercourse are also affected by increased development in the catchment. Urban development increases the quantity of run-off and decreases the amount of rainwater which is absorbed into the ground. The time taken for the rain to reach watercourses is reduced, particularly where the developed area is sewered direct to the watercourse system. These aspects affect the flow regime in a catchment often leading to increased flood peak flows and reduced base flows.

Through liaison with Planning Authorities, the NRA seeks to ensure that the effects of development on the flow regime of the catchment's watercourses are minimised.

Local Perspective:

Surface Water Sources

The River Severn is regulated in accordance with the Clywedog Reservoir Joint Authority Act 1963 as amended in 1979. Releases are required to supplement low flows and hence to safeguard large abstractions in the middle and lower reaches of the

river and to maintain an adequate flow to the estuary at Gloucester.

When flow in the Severn at Bewdley is above the statutory threshold these releases are not required and water is conserved in the reservoirs, except for water released in connection with the generation of hydro-electric power and/or for environmental purposes.

In addition to the regulation of flows in the river during low flow periods, the NRA also exercises control over the discharges from Llyn Clywedog and Lake Vyrnwy in order to provide limited mitigation of flooding in the rivers downstream.

Operating control rules have been drawn up which specify how the reservoirs will be operated, both singly and jointly in conjunction with the Shropshire Groundwater Scheme. These rules are in course of review during which the changing needs of the environment, river abstractors and other river users are being taken into account.

Reservoir release changes are carried out progressively to minimise inconvenience to downstream recreational river users.

Prescribed flows exist on many rivers to protect the aquatic environment against excessive abstractions (Table 3 Section 4.2). The NRA is in the course of formulating an improved rationale to relate restrictions to use-related flow needs in the aquatic environment.

Groundwater Sources

Water quality targets are covered by the NRA's 'Policy and Practice for the Protection of Groundwater' (Section 5.2).

Water quantity targets are related to resource capacity and the environmental needs of watercourses reliant on groundwater to sustain baseflows during periods of dry weather.

Parts of five groundwater management units fall within the plan area, together with river gravels. The remainder of the catchment is currently exempt from groundwater licensing abstraction.

The long term objective is to reduce abstractions in any overpumped groundwater unit to a use level which is sustainable. In groundwater units where resources are available further licensing of new abstractions is possible, but the objective is to ensure this is not beyond the sustainable limit.

New Abstractions

The NRA determines new abstraction licence applications within the framework of the Water Resources Act 1991. The impacts of new abstractions will be carefully considered on their own merits and viewed in the light of problems specific to the

catchment. The NRA will only grant new licences if it is confident that the available resources are able to sustain the proposed abstraction in the long term without harm to the environment or existing abstractors, and the needs of the applicant are justified.

It is the practice in the NRA Severn-Trent Region to restrict licences to different flow rates. The more recent the licence then the earlier in the season is the likelihood of a licence restriction being imposed. While these restrictions help to provide protection to the environment they are not in themselves targets. In some areas it is only by gradual control of some of these licences of right that future quantity targets are likely to be achieved. Compensation releases for new groundwater abstractions will be carefully considered where there may be an impact on surface water features.

Surface Water Control

Unless carefully sited and designed, development can increase the rate and volume of surface water run-off, resulting in increased risk of flooding downstream. Surface water control is vital in expanding urban areas, but has not been identified as a particular problem for the majority of development sites in this catchment. Flood Defence targets (Section 5.4) should be referred to.

Future Demands for Water Use

The NRA has analysed information on water use and has prepared a Regional Water Resources Strategy. It will be reviewing forecasts of future demands to try and anticipate needs for water resources developments and consider ways of meeting those future demands.

For public water supplies the NRA expects the fullest opportunities will be taken for effective demand management, particularly in the area of leakage control and in the introduction of domestic metering in zones of resource shortage. In all dealings with potential new abstractions, the NRA will seek to achieve no environmental disbenefits from any new arrangements, whether for minor local improvements or from strategic considerations associated with conjunctive use of major sources.

5.4 PHYSICAL FEATURES TARGETS

General

This section considers targets for physical features on rivers and river corridors in the catchment. Fishery, Conservation and Recreational matters and Flood Defence works are dealt with under this heading. The term conservation includes flora, fauna, features of archaeological, architectural, historic and physio-graphical interests.

Many Uses are affected by the physical characteristics or features of the river and this is especially true of Uses related to wildlife and its conservation. The habitat requirements of the wildlife associated with rivers are too complex to allow simple targets to be set, even if such habitats could be effectively measured. Consequently, until such time as quantitative physical targets can be set, Catchment Plans will adopt the general theme that the abundance and diversity of physical features, typical of the type of river, should be maintained and where possible, improved. This requires subjective assessment by trained staff. The NRA is also developing a habitat classification system and use related targets for physical features such as spawning and nursery sites for fish.

In a similar manner the physical features requirements of recreational Uses of waters cannot yet be quantified in order to set firm targets, again professional judgment must be used.

Flood Defence targets nearly all relate to physical features and the requirement for the river channel to contain certain specified flows at different points in its length.

CONSERVATION TARGETS (including wildlife, landscape and archaeological interest)

The NRA is currently testing a survey methodology for river habitats in 1994 on which a national habitat classification scheme for rivers will be based. Together with the Strategic River Corridor Surveys this will assist in setting specific targets for conservation. Until more detailed targets are set the following general targets are to:

- * Ensure that future development does not reduce the conservation value of the river corridor and where possible improves it.
- * Undertake environmental assessment of all NRA works and identify opportunities for increasing the conservation value of rivers and wetlands and for improving the quality of the water-related landscape in association with these works.
- * Carry out NRA consenting practices and respond to development proposals in a manner that ensures that natural features such as emergent vegetation, meanders, pools and the landscape are preserved and enhanced where appropriate, and features of archaeological, architectural and historic interest are preserved.

CATCHMENT TARGETS

- * Seek opportunities for the NRA to carry out capital projects to protect or improve the physical character of the water environment.
- * Liaise with other bodies to promote and support initiatives for the maintenance of wetland, wet meadows, in-stream and bankside habitats.
- * Seek opportunities, where appropriate, to control livestock access to river banks, thus minimising bank damage and allowing regeneration of bankside vegetation in order to maintain habitat, shade cover and natural vegetation for the benefit of wildlife in the river corridor.

FISHERIES TARGETS

The general aim for all fisheries is a sustainable level of exploitation by the rod fishery whilst conserving the natural history of the stock. Trends in fish stock abundance can be identified and comparisons made with 'expected' abundances based upon habitat characteristics. A methodology to determine specific salmon spawning targets is presently being developed.

General targets are to:

- * Control illegal fishing by use of a bailiff force in anti-poaching patrols and by targeting the market in illegally caught fish.
- * Maintain an abundance of juvenile salmon, brown trout and coarse fish (where they presently exist) which is related where possible to the carrying capacity of the catchment based upon habitat characteristics.
- * Maintain existing high quality fishery habitats in the catchment and where possible restore damaged fishery habitats.
- * Provide access, where appropriate, for salmon and trout to all suitable spawning and nursery areas.
- * Mitigate or reduce the impact of acidification processes on upland salmonid spawning and nursery areas.
- * Maintain a monitoring programme which quantifies accurately stock abundance.

RECREATION/AMENITY TARGETS

Targets are to:-

- * Collect data on the recreational resource to help resolve existing conflicts and to plan for the future.
- * Promote suitable access and associated facilities appropriate for identified recreational uses.

FLOOD DEFENCE TARGETS

The NRA uses a system of land use identification for flood defence purposes which is based on the concept of House Equivalents (HE). This takes each type of land use in the flood plain for example housing, commercial, retail, manufacturing, rural (arable, pasture, horticulture) and using the potential losses due to flooding equates them to HE figures. The HE figure also takes into account the flooding of transport routes and the resultant costs to the community of alternative transport arrangements.

The land use bands are related to Standards of Service (SOS) which define an 'acceptable' level of protection in terms of frequency of flooding of land or property. This frequency is expressed as a return period for example, 1 in 50 years. This is a measure of the likelihood of a flood, where a 1 in 50 year flood has a 2% chance of occurring in any year.

Map 21 shows the land use bands for main river in this catchment, and full definitions are given in Table 8.

Improvement and maintenance works are targeted towards those watercourses which are under serviced (i.e. do not meet their SOS), particularly where the higher land use bands (A to C) are involved.

Preservation of Flood Plain and Flood Risk Management

The NRA seeks to ensure that flood risks are not increased by development, thereby resulting in unnecessary measures. It does this by close liaison with local planning authorities. The following targets are used:-

- * No loss of flood plain flow or storage capacity.
- * No increase in flood risk as a result of development.
- * No new development in an area where the existing level of service is considered below the standard required for the type of development proposed.
- * Provision of suitable access for maintenance of the river channel.

Flood Warning

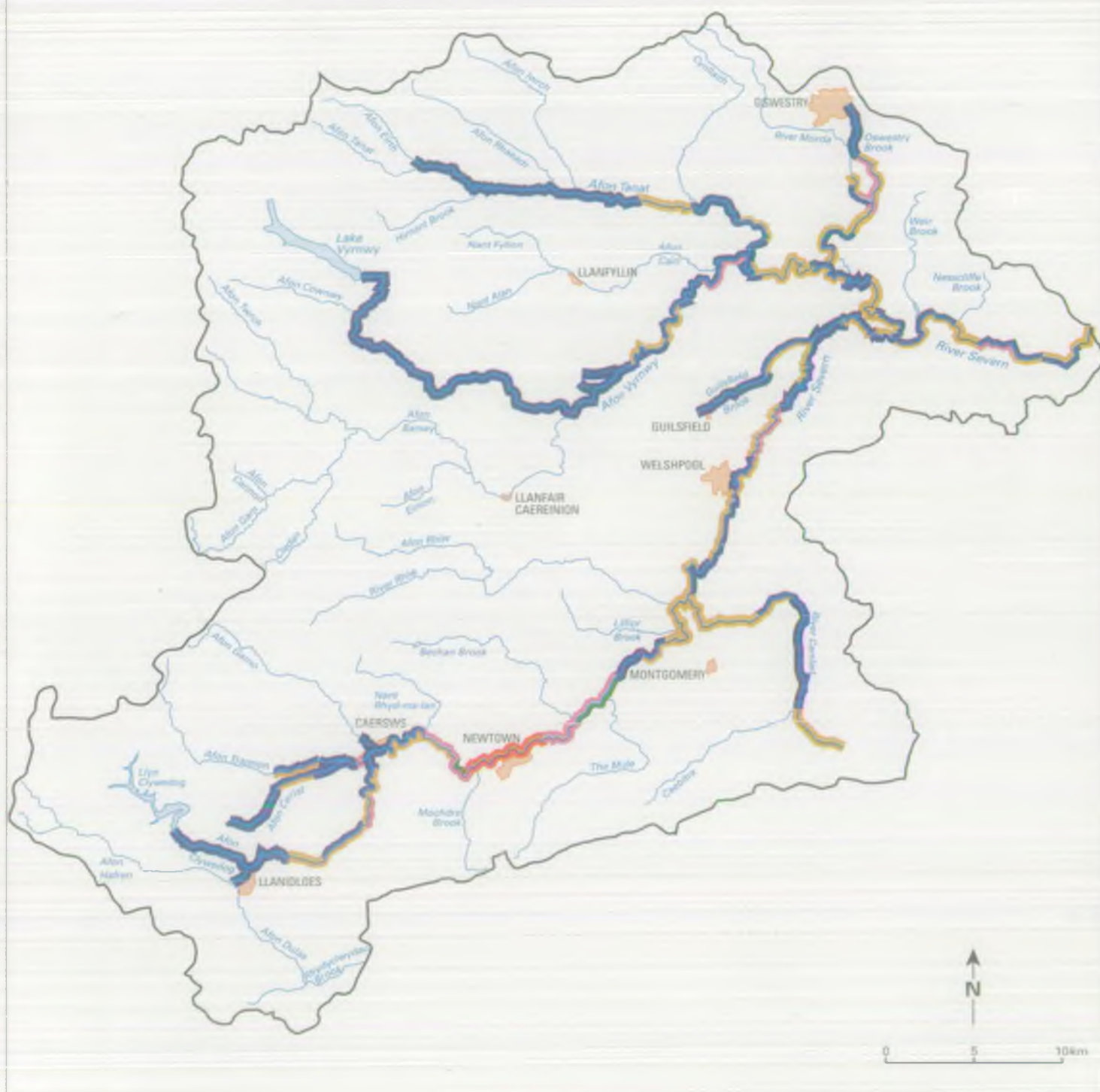
The NRA target is to provide a minimum of 2 hours warning of the commencement of flooding.

Local Perspective

The NRA provides flood warning for land and property directly affected by flooding downstream of Llandinam on the Severn and New Bridge, Meifod on the Vyrnwy. The target in the catchment is to provide a minimum of 2 hour warning of the commencement of flooding without issuing more than 10% unnecessary warnings. At the present state of development of flood forecasting technology, it is very difficult to achieve the above target time of 2 hours in lengths of the river upstream of Welshpool and Llanymynech, where rivers respond very rapidly to rainfall.

As part of its capital works programme the NRA is undertaking a detailed survey of all flood defences and assets. The assets currently identified for renewal or improvement and other capital projects in the programme are:-

- Improvements to the River Severn and Vyrnwy Argaes at Haimwood, Rhandregynwyn, Shores to the Ark, Melferley to the Shores.
- Guilsfield Brook embankments.
- River Severn flood plain mapping.
- River Vyrnwy flood plain mapping.



KEY

— Catchment Boundary

- Land Use Band A
- Land Use Band B
- Land Use Band C
- Land Use Band D
- Land Use Band E

TABLE 8- Indicative Standards of Protection for Flood Defence and Land Drainage

Land Use Band	Description of Typical Land Use	Indicative Standard of Protection*	
		Non-Tidal	Tidal
A	High density urban containing significant amounts of both residential and non-residential property.	100	200
B	Medium density urban. Lower density than Band A, may also include some agricultural land.	75	150
C	Low density urban or rural communities with limited numbers of properties at risk. Highly productive agricultural land.	25	50
D	Generally arable farming with isolated properties. Medium productivity agricultural land.	10	20
E	Predominantly extensive grass with very few properties at risk. Low productivity agricultural land.	1	5

The quoted Indicative Standards of Protection provide a starting point to guide the investigator of a potential flood alleviation scheme towards a practical level of investigation. The resulting Standard of Protection would be the outcome of a case specific and appropriately detailed appraisal. This would consider Benefit/Cost and Incremental Benefit/Cost ratios, plus any other significant factors, for example, legal, environmental, etc.

SECTION 6.0 CURRENT STATE OF THE CATCHMENT

The following section examines the ability of the catchment to support the Uses identified in Section 4, by assessing compliance with the targets set out in Section 5. In this manner key Issues in the catchment can be identified. The Issues are discussed in detail in Section 3.



- Grade A
- Grade B
- Grade C
- Grade D
- Grade E
- Grade F
- Unclassified

6.1 SURFACE WATER QUALITY

General

The NRA uses two major schemes for the reporting of river water quality: the General Quality Assessment (GQA) scheme, which is used to make periodic assessments of the water quality; and the statutory water quality objectives (WQOs) scheme, which is used for the setting of water quality planning targets. These new schemes have replaced the National Water Council (NWC) scheme, upon which previous references to water quality have been based.

The GQA classification provides a means of accurately assessing and reporting on the general state of river water in a nationally consistent manner. It is used to support periodic assessments of the quality of river water in order to report upon geographical and temporal trends in river water quality. The GQA scheme comprises four components - general chemistry, nutrients, aesthetics and biology - each providing a discrete 'window' upon the quality of river stretches.

Details of the chemistry and proposed biological components are included as Appendix 3. Details of the aesthetic and nutrient components are still under consideration by the NRA and do not form part of this assessment.

Local Perspective

Data from 1991 - 1993 chemical and biological monitoring programmes has been used to report on current river water quality.

Map 22 shows the GQA chemical water quality and Map 23 shows the GQA biological water quality.

Several reaches have not been graded due to insufficient data being available from monitoring points recently created as a result of new stretches being established under the River Ecosystem objective setting exercise (see Section 5.1).

Table 9 details the lengths of river and canal within each chemical and biological grade band, as explained in Appendix 3. Although there is no direct comparison between chemical and biological grades, using broad generalisations as to quality ie Good, Fair, Poor and Bad it can be seen that there is a good correlation between the Chemistry and Biology components of the GQA for the rivers in this plan area.

River and canal monitoring points downstream of known discharges of dangerous substances are required to comply with the Environmental Quality Standards for List I & II substances under the EC Dangerous Substances Directive. Toxic metal standards relate to total hardness of the water and the sensitivity of the aquatic life being protected. See Appendix 4. The River Severn at Aberbechan is the only monitoring point reportable for failing Environmental Quality Standards (details are

CURRENT STATE OF THE CATCHMENT

given in Table 10).

Table 10 identifies all monitoring points which do not achieve environmental quality standards for dangerous substances. Exceedances are either due to drainage from the naturally occurring metal enriched bedrock, which gave rise to the proliferation of mining in the 19th Century (see Section 4.7), or acid run-off due to the combined effects of increased acidic atmospheric pollutant deposition and land use change (see Section 4.9). In some cases both may be contributing. Consequently, although the River Severn at Aberbechan is downstream of Newtown Sewage treatment works, which is consented for the discharge of toxic metals, it is unlikely that this reportable failure is associated with the discharge.

In addition to audit water quality monitoring, an investigation into the watercourses either already acidified or sensitive to increased acid run-off has been undertaken. Map 12 shows the catchments which are assessed as being sensitive in relation to the bedrock and soils ability to buffer acidic deposition. This sensitivity is classified by total hardness in the receiving watercourses.

Pollution Incidents

During 1993 137 pollution reports were received and investigated in this catchment; 3 were identified as 'major', 26 as 'significant' and 108 as 'minor'. The largest single cause and source of pollutant was agriculture followed equally by oil and sewage.

TABLE 9 General Quality Assessment - 1993 Summary of Lengths of River and Canal in Each Grade (km)

CURRENT STATE OF THE CATCHMENT

RIVER/CANAL	CHEMISTRY COMPONENT GRADE							BIOLOGICAL COMPONENT GRADE				
	GOOD		FAIR		POOR	BAD	NOT ASSESSED	GOOD	FAIR	POOR	BAD	NOT ASSESSED
	A	B	C	D	E	F		A	B	C	D	
River Severn	56.8	35.9					20.3	113.0				
Afon Dulas							5.0	5.0				
Afon Clywedog	5.3							5.3				
Afon Cerist	9.0									9.0		
Afon Trannon	8.5							8.5				
Afon Garno		10.0						10.0				
Bechan Brook			10.5					10.5				
Mule	11.0							11.0				
Afon Rhiw	1.0						27.4	28.4				
Camlad		23.2						23.2				
Guilsfield Brook/New Cut							9.8	9.8				
Afon Vyrnwy	24.8	21.9					18.9	65.6				
Afon Cownwy	1.5							1.5				
Afon Banwy		12.5					17.0	29.5				
Afon Twrch	7.5							7.5				
Afon Gam	9.0							9.0				
Afon Cain	11.0							11.0				
Afon Tanat	27.4							27.4				
Afon Iwrch	7											7
Cynllaith	12											12
Afon Rhaeadr	8.0							8.0				
River Morda	4.0	10.5	1.6					5.5	6.1	4.5		
Sarnwen Brook							5.5			5.5		
Weir Brook			9.2							9.2		
Montgomery Canal	17.5	8			5.0		10.0					40.5
TOTAL	221.3	122	21.3	0	5.0	0	113.9		6.1	28.2	0	59.5
	343.3		21.3		5.0	0	113.9	389.7	6.1	28.2	0	59.5

CURRENT STATE OF THE CATCHMENT

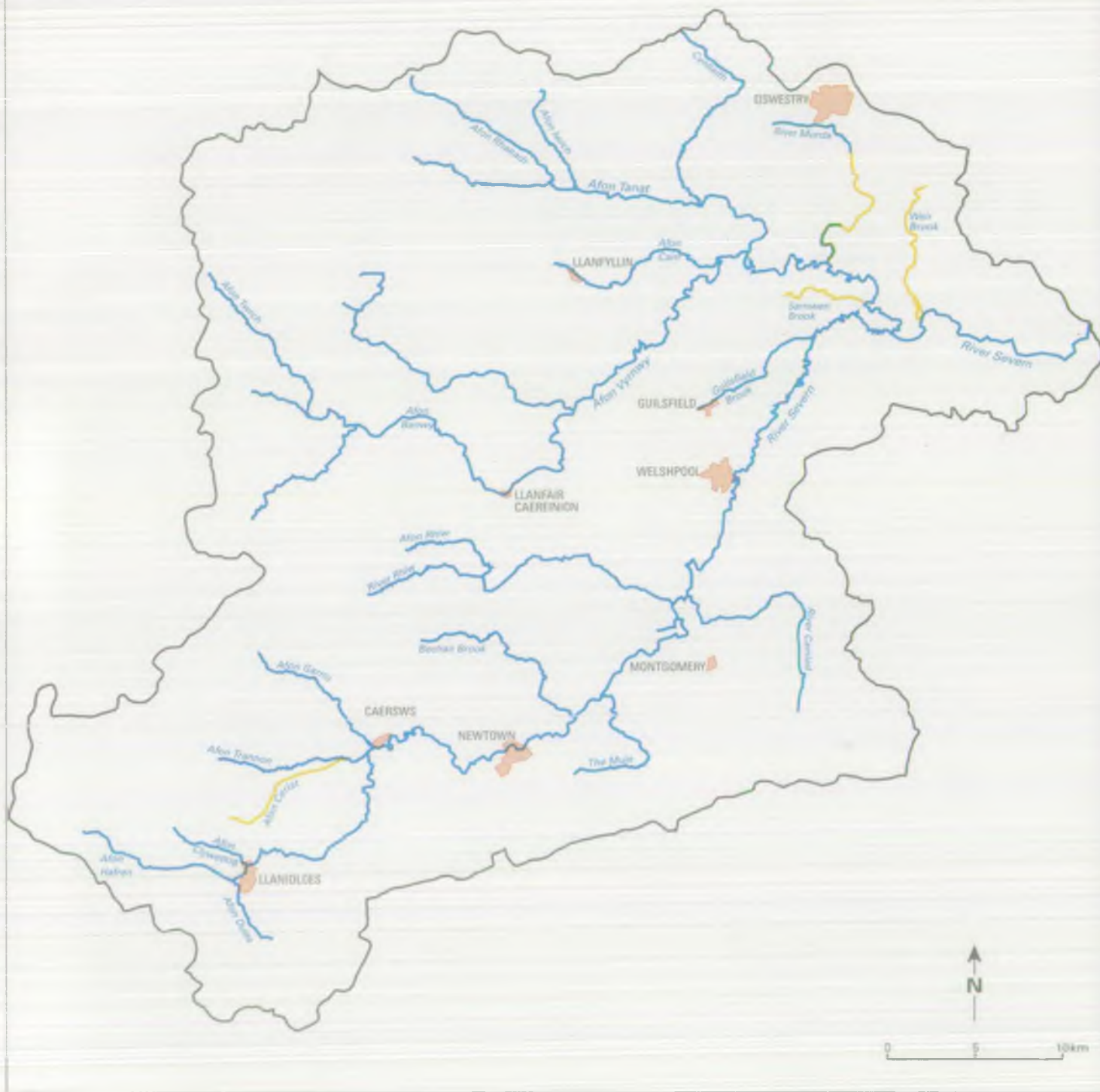
TABLE 10 Exceedances of Environmental Quality Standards For Dangerous Substances.

				TOTAL ZINC		SOLUBLE COPPER		SOLUBLE LEAD		pH	
Watercourse	Sampling Point	Fish	Tot Hard	MEAN	EQS	MEAN	EQS	MEAN	EQS	Min	EQS Range
			mg/l	µg/l	µg/l	µg/l	µg/l	µg/l	µg/l		
River Severn	Caerhowell	S	<50		8	2.8	1				
	Aberbechan *	S	<50	40.1	8	3.0	1				
	Newtown	S	<50	45.2	8	3.1	1				
	Caersws	S	<50	58.2	8	3.2	1				
	Llanidloes	S	<50	14.7	8	2.6	1				
	Old Hall									5.0	6.0-9.0
	Rhydyronen									4.7	6.0-9.0
	Cwm Rickett									4.5	6.0-9.0
Afon Dulas	Pentre Dulas	S	<50			3.2	1				
Afon Clywedog	Gauging Weir		<50			3.1	1				
	Dam Scour Valve									5.7	6.0-9.0
	Dam Lower Valve									5.6	6.0-9.0
	Dam Upper Valve									5.8	6.0-9.0
Afon Cerist	Carnedd		<50	278	75	3.2	1				
	Minor Bridge		<50	976	75	4.1	1				
	Cerist Bridge		<50	1775	75	3.6		196	50		
	Van Bridge		<50	3740	75	4.9	1	375	50		
Afon Trannon	Bodaloch		<50			2.9	1				
	Glan yr Afon		<50			2.3	1				
Afon Garno	Garno Bdg	S	<50			2.9	1				
	Pontdolgoch	S	<50			3.2	1				
Afon Vyrnwy	Godor	S	<50			2.6	1				
	Below Dam	S	<50	12.5	8	1.6	1				
Afon Tanat	Llanyblodwel	S	<50	17.1	8	2.5	1				
Afon Rhacadr	Penygeulan		<50			1.9	1				
Afon Banwy	Llanerfyl	S	<50			2.5	1			5.9	6.0-9.0
	Dol Pebylg									5.7	6.0-9.0
	Foel									5.4	6.0-9.0
Afon Twrch	Foel									5.1	6.0-9.0
	Pentre Bach									4.7	6.0-9.0
	Doly-y-Gaseg									4.2	6.0-9.0
	Ceriau									4.4	6.0-9.0

S = Salmonid

EQS = Environmental Quality Standard

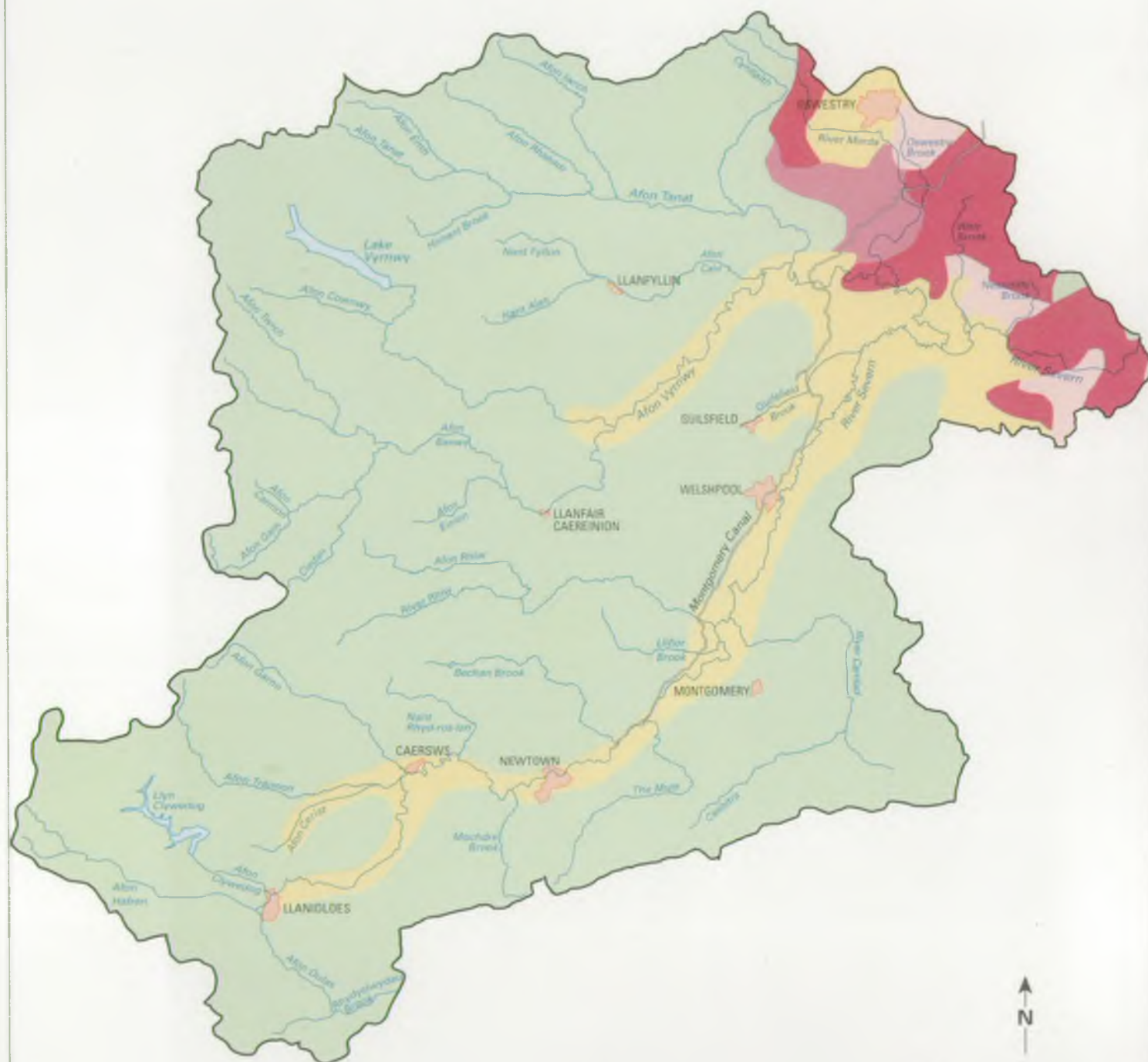
* Reportable under the EC Dangerous Substances Directive.



KEY

- Catchment Boundary

- Grade A
- Grade B
- Grade C
- Grade D



KEY

- Catchment Boundary
- Canal

- Non Aquifer
- Minor Aquifer
- MAJOR AQUIFER
 - Low Vulnerability
 - Medium Vulnerability
 - High Vulnerability

6.2 GROUNDWATER

General

Work is generally underway to develop a groundwater classification scheme for inclusion in Statutory Water Quality Objectives. The NRA is producing groundwater vulnerability maps for England and Wales, based on geological and soil vulnerability classification.

Geological strata which contain groundwater in exploitable quantities are called aquifers whereas rocks which do not readily transmit water are called non-aquifers.

Major Aquifers are highly permeable formations usually with a known or probable presence of significant fracturing. They may be highly productive and able to support large abstractions for public supply and other purposes.

Minor Aquifers can be fractured or potentially fractured rocks which do not have a high primary permeability, or other formations of variable permeability. Although these aquifers will seldom produce large quantities of water for abstractions, they are important for local supplies and in supplying base flows for rivers.

Non-Aquifers are formations with negligible permeability that are generally regarded as not containing groundwater in exploitable quantities.

Local Perspective

Much of the catchment is underlain by Non-Aquifer, and groundwater resources throughout the area are generally very limited. Map 24 shows the extent of Non-Aquifer, and Minor and Major Aquifers in the catchment. The area will be mapped in detail during 1995.

The Non-Aquifer consists mainly of siltstones and mudstones. Water tends to be held in fissures and is present only in small quantities.

The Coal Measures strata in the north east of the catchment are classified as Minor Aquifer. Limited groundwater resources are found in sandstone and fractured mudstone bands in these rocks. The superficial deposits throughout the area often associated with watercourses tend to be in hydraulic continuity with surface waters and are also classified as Minor Aquifer in terms of their vulnerability.

The Major Aquifers are confined to a small area in the north east of the catchment. They include the fractured Carboniferous Limestone and the Permo-Triassic Sandstones. Map 5 and Sections 4.2 and 6.3 give more detail on Groundwater Units in the Major and Minor Aquifers.

CURRENT STATE OF THE CATCHMENT

Where groundwater is close to the surface, its vulnerability to localised pollution is increased. The Major Aquifers in the north east of the catchment in particular are highly vulnerable to pollution.

Any groundwater quality problems that do exist tend to be of only local extent due to the low permeability of the majority of the rocks. There are a few isolated areas of contaminated land associated with industrial areas in towns and past metal mining (eg. Fan lead mine) but the most common problem tends to be due to the proliferation of septic tank drainage throughout the area.

Although little data are available on the quality of groundwater, the NRA is not aware of any quality problems other than those mentioned above.

6.3 WATER QUANTITY

General

A catchment would fail its targets for water resources if abstraction was causing rivers and streams to dry up or flows to become unacceptably low, or if groundwater levels were declining or groundwater quality deteriorating.

Licences of Right had to be granted in 1965 without regard to the ability of the resource to sustain the abstraction in the long term without detriment. Over the years, the actual rates of abstraction have, in some cases, increased to the volumes specified in the licences. As this occurs, the potential arises for unacceptably low flows or declining groundwater levels.

The NRA has carefully considered the available surface water and groundwater resources within the catchment and their degree of utilisation. Generally there are no major problems at present with overabstraction of groundwater, however there are problems with surface streams drying up during summer dry spells. The following sections summarise the results of this analysis.

Local Perspective

Surface Water Surface water is measured continuously at 28 river level recorders in the catchment. Flow duration curves for 7 of these stations are plotted by the
- River Flows NRA. These curves show how often a particular flow has occurred during the period of record.

Flows at other locations are occasionally gauged by current meter, particularly during periods of low flow, when formal surveys are undertaken involving measurements at several sites during periods of dry weather.

The key flow parameter is the Dry Weather Flow (DWF) to represent the most likely lowest 7 day flow in any year. In the past a 95% exceedence flow was used as a reference point but this statistic has fallen from favour since the drought of 1975/6.

In the River Severn flows are maintained by regulation releases from reservoirs and the Shropshire Groundwater Scheme. The Afon Vyrnwy also benefits downstream of Lake Vyrnwy from river regulation releases.

In all other rivers the measured flows reflect the balance between licensed abstractions and consented discharges and the overwhelming natural variation in flow arising from wet and dry seasons or runs of years.

River flows on uncontrolled tributaries fall very low during summer dry spells eg. Afon Dulas DWF of 5Ml/d at Rhos y Pentref. Tributaries controlled by reservoirs, in contrast, are maintained by compensation releases or by larger releases to regulate River Severn flows eg. Bryntail and Vyrnwy Weir. Details are shown in Table 11.

CURRENT STATE OF THE CATCHMENT

TABLE 11 - Reliability of River Flow

River	Gauging Station	Start of Record	Catchment Area km2	Natural Minimum Flow ML/d	Dry Weather Flow ML/d	Percentage Time Stated Flow Exceeded					Period of Flow Record Years	Prescribed Flow ML/d
						50% ML/d	75% ML/d	90% ML/d	95% ML/d	99% ML/d		
Dulas	Rhos-y-Pentref	10/1969	52.7	1	5.5	63	21	7	4	1	25	55
(R) Clywedog	Bryntail	06/1977	49.0	-	28.0	136	123	30	25	22	17	
Severn	Abermule	06/1960	580	12	126	665	327	196	153	86	33	
(R) Vyrnwy	Vyrnwy Weir	01/1908	94.3	-	40.7	52	46	45	42	26	75	
Tanat	Llanyblodwel	06/1973	229	11	49.0	347	135	66	44	26	17	
Vyrnwy	Llanymynech	04/1970	778	27	182.6	1031	438	244	189	114	25	
Severn	Montford	06/1952	2025	70	446	2119	973	582	479	264	41	

(R) = Downstream of Large Reservoir.

The effect of flow augmentation releases from Llyn Clywedog in the River Severn can be seen at Abermule, where the low flows are enhanced. A similar situation occurs on the Afon Vyrnwy downstream of Lake Vyrnwy as shown by data at Llanymynech. The continued influence of both rivers is seen at Montford, which has flows of >8,000 MI/d for 10% of the time, but a DWF of 446 MI/d (Table 11).

The yield of baseflows to watercourses has been mapped for Dry Weather Flow conditions (Severn Trent Water Authority 1980). It varies from as low as <0.1 MI/d/km² in the central parts of the catchment, to over 0.4 MI/d/km² on the peaty slopes of Plynlimon. Under minimum flow conditions, most of the catchment produces <0.05 MI/d/km².

Surface Water Prescribed flows affecting surface water abstraction in the catchment are listed in Table 3 (Section 4.2). Early issued licences were related to River Severn flows at Bewdley at a flow in excess of the then regulated minimum maintained flow (MMF). These flows now only occur during droughts when the continued support of the present 850 MI/d Bewdley maintained flow is not sustainable. The remaining prescribed flows used to control abstractions in the catchment have generally been based on 95% flow exceedance at gauges on similar nearby sub-catchments.

Groundwater Water levels are monitored at observation points listed in Appendix 5. From this data it is possible to determine whether the aquifer units are being over abstracted. The three sandstone Groundwater units in the catchment are managed according to their intensity of use. The large number of monitoring sites in the Ensdon Unit are to ensure any effects arising from pumping of Phase II of the Shropshire Groundwater Scheme are well documented in accordance with the needs of the Shropshire Groundwater Order, 1981.

The KNOCKIN Groundwater Unit (see Map 5), although supporting over 70 licences in the plan area, is licensed for less than 50% of the assessed recharge so remains available for further small licence applications. The unit is currently in category D (See Section 5.2). Baseflows near to the large Kinnerley abstraction have reduced so further large licences are unlikely. A recent large application at Morton has been given a time-limited licence after appeal.

The ALBERBURY Groundwater Unit (see Map 5), is overabstracted, although some water is likely to originate from the River Severn. It contains less than 10 licences in the plan area, but two of these are large, time-limited public water supply licences at Eyton and Ford which are licensed for 8.4 MI/d. The time limits are to enable appraisal of the extent to which River Severn water is available to the unit. Levels are being monitored to assist in the determination of these licences when the time limit is reached. Groundwater levels are falling steadily over most of the unit. Category A

CURRENT STATE OF THE CATCHMENT

(Section 5.2), means no further licences can be issued for this unit.

The ENSDON Groundwater Unit (See Map 5), contains 13 licences in the plan area, of which one refers to the 4 Shropshire Groundwater Scheme sites described in Section 4.3. The other licences are small so total licensed quantity is less than 50% of the assessed recharge, leaving some resource available for further licensing. The unit is currently in category D (Section 5.2). The Shropshire Groundwater Scheme licence is restricted over a 5 year period to ensure that only intermittent pumping is allowed.

Abstractions from superficial deposits at Llandinam (13Ml/d) are mostly from river gravels in hydraulic continuity with the River Severn. Abstraction has increased four fold over 20 years and new supplies for Montgomeryshire are being sought by Severn Trent Water. A large number of other abstractions are also licensed from the superficial deposits. A recent application for a second large abstraction from the superficial deposits for public water supply (10-25 Ml/d) at Fron near Abermule is awaiting determination.

Supplies in the north east of the catchment are less than plentiful, with the source at Kinnerley showing a doubling of output over 7 years, and the proposed new source at Morton being subject to an enquiry because of concern about a local SSSI wetland. The remaining two large public abstractions have also exhibited large increases over the past twenty years - x2.5 at Ford and x5 at Eyton. All these four sources have used at or close to their full licensed entitlement during the 1990s.

6.4 PHYSICAL FEATURES

General

Since Physical Features targets are the most subjective (Section 5.4), it follows that much of the assessment of the state of the catchment must also be subjective. Data from many sources including routine fisheries, biological and habitat surveys and special investigations are used to identify areas that are apparently deficit in certain essential or desirable features such as spawning gravels, riparian tree cover or in-river habitats.

Flood defence has been assessed by studying flood history and the known distribution of flooding.

The following sections illustrate the current state of the catchment and identify areas where there are felt to be deficiencies.

CONSERVATION

Habitat The catchment maintains a relatively high value for conservation landscape despite post war land use changes, especially agricultural improvements and afforestation, which have decreased the ecological diversity. However, many high quality conservation features are under continuing threat from such developments, and from a lack of positive habitat management measures. Much of the wetland habitat in areas such as the Severn-Vyrnwy confluence has been lost, and considerable scope exists for restoration and for the creation of new wetlands, such as those recently developed at Dolydd Hafren and Welshpool.

Fauna The catchment remains a stronghold for otter populations. However, wading bird populations, most notably lapwing and curlew, have suffered severe declines in recent years, through loss of wetland habitats. Dippers may also have declined in some upland acidified streams as a result of poor invertebrate faunas in these watercourses. Invertebrate populations are also poor in the Afon Cerist because of heavy metals, but are of high quality in most other rivers. Crayfish populations in the River Camlad have recently been affected by crayfish plague and native populations elsewhere in the catchment are at risk if further introductions of alien species take place.

Flora Native riparian vegetation is at risk in some areas through the spread of invasive weeds, especially Japanese knotweed.

Archaeology Although there are relatively few Scheduled Ancient Monuments situated close to watercourses, a number of listed structures and sites and monument records can be found within the flood plains. These sites need to be safeguarded. Additional survey work is required to improve existing records, particularly in the Severn-Vyrnwy confluence area (refer Issue 23).

FISHERIES**Stock Levels**

Map 25 shows the distribution and relative abundance of salmon stocks in the catchment from electric fishing surveys carried out in 1991. The low, moderate and high abundance ranges correspond to actual density ranges of <5.0, 5.0-15.0 and >15.0 fish per 100m² respectively. Abundances for tributary rivers are the average of all sites sampled, whilst those on the larger rivers (Severn, Vyrnwy, Tanat) are individual site values. The distribution of salmon is limited by obstructions to migration of adult fish ascending the river to spawn, and by acidification problems in certain tributary systems. Elsewhere, juvenile salmon abundances are generally high or moderate in tributary streams and low in the larger rivers, probably reflecting the more suitable habitat of the smaller watercourses and the higher proportion of spawning occurring in these areas.

Trout populations (Map 26) are similar to salmon in their distribution and patterns of abundance but are also found upstream of structures obstructing salmon migration. Density ranges equate to actual values of <5.0, 5.0-10.0 and >10.0 fish per 100m², with higher numbers of fish most often found in tributary streams rather than the larger rivers.

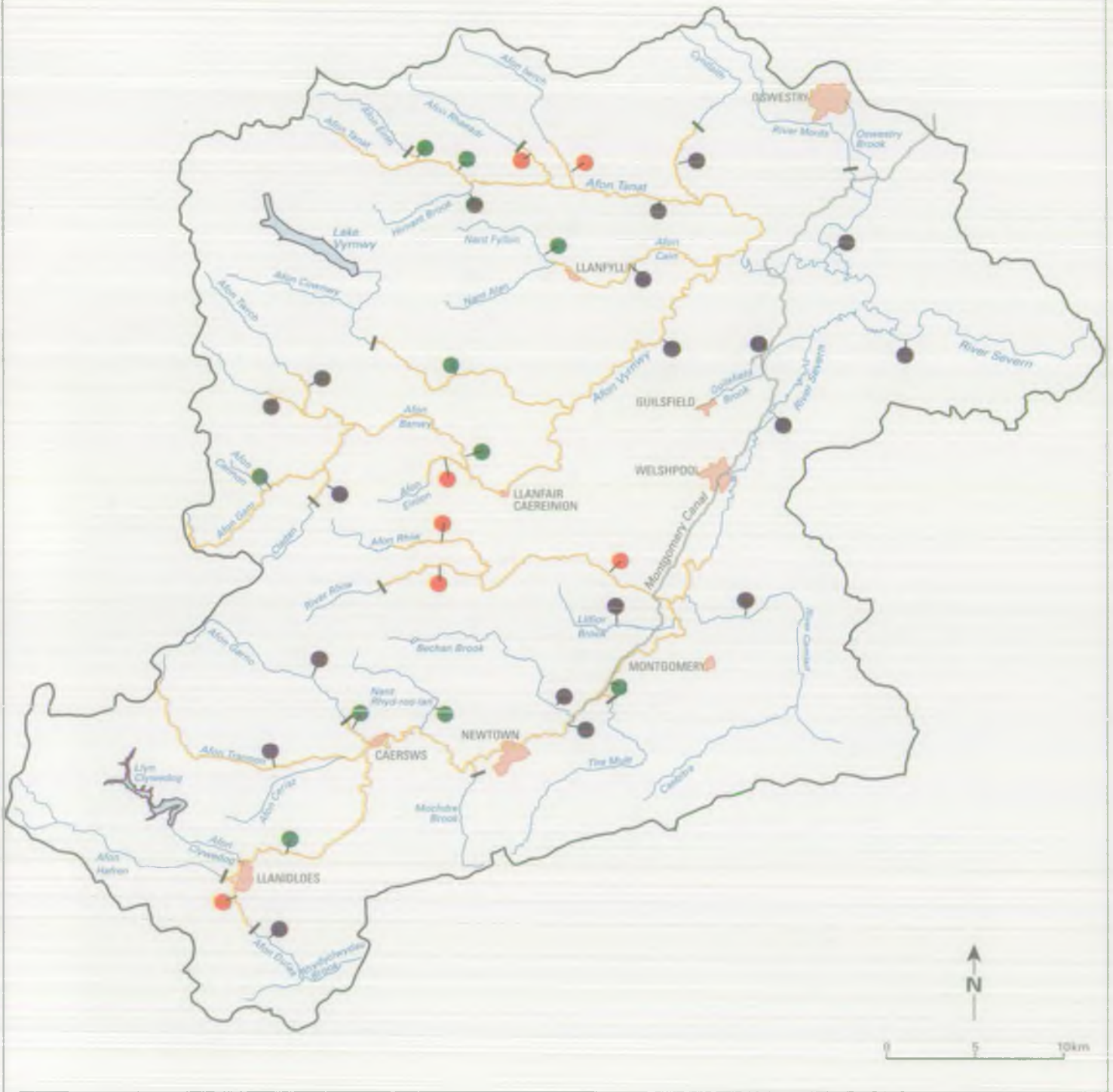
Coarse fish species are present throughout most of the catchment except the upper 10km of the River Severn. Upstream of Llanidloes, and in most of the smaller tributary systems, species are limited to four:- stone loach, bullhead, minnow and eel. With distance downstream the number of species increases. Grayling, dace, chub, occasional pike and brook lamprey are present from Llanidloes with barbel, roach, gudgeon and perch downstream of Penarth Weir. Significant populations of coarse fish species, mainly grayling, barbel, chub, dace and pike are present in the lower reaches of the Vyrnwy, Tanat and Banwy. Grayling stocks remain below normal in some rivers, especially the River Tanat, following declines during the drought years of 1975 and 1976.

Catches

Salmon rod catches in the area have been poor for the last three years. Catches during the 1977 to 1989 period ranged from 131 to 962, with an average of 444 per year. Catches in 1990, 1991 and 1992 were 114, 87 and 117 respectively.

Obstructions

Obstructions to salmon migration are shown on Map 25. Over 100 km of potentially high quality salmon spawning and nursery areas are inaccessible as a result of these obstructions. A fish pass on Pont Dolgoch Weir would provide good access to a further 12 km of the Afon Garno which could support at least 50 pairs of spawning salmon. Fish passes on the River Mule and the River Vyrnwy (Dolanog) are unlikely to be cost effective. Removal of weirs may be an option on the Mule, and stocking with hatchery reared juvenile salmon above the falls is the preferred strategy at Dolanog. Weir removals and/or stocking upstream are possible solutions

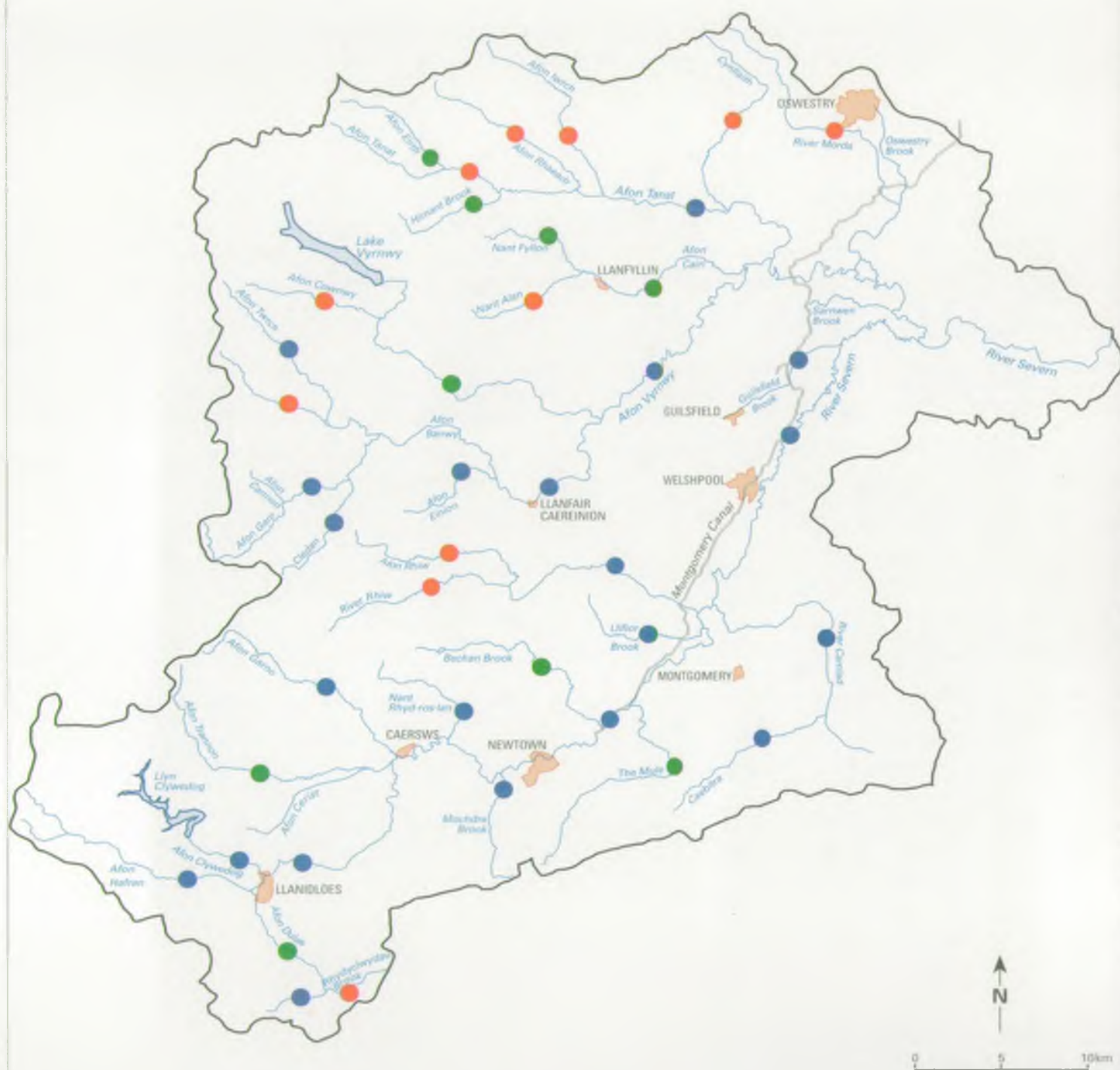


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
- Catchment Boundary
— Canal

Density ranges

- High - > 15 fish/100m²
- Moderate - 5 -15 fish/100m²
- Low - < 5 fish/100m²
- Obstructions to migration
- Salmon spawning and rearing stretch



KEY

- Catchment Boundary
 Canal

DENSITY RANGES

- High - > 10 fish/100m²
- Moderate - 5 - 10 fish/100m²
- Low - < 5 Fish/100m²

CURRENT STATE OF THE CATCHMENT

at other obstructions. Improving access for migratory fish on the Afon Dulas at Tylwch Rocks, however, could have unacceptably damaging impacts on the isolated population of native brown trout upstream.

Water Quality Fish life is adversely affected by acidification problems which occur in some upland watercourses, most notably the top 10 km of the River Severn which is almost devoid of fish as a result. The Afon Twrch is also badly affected and the Afon Gam could be at risk in future years as forestry plantations in the catchment reach maturity. Land use changes, especially afforestation, have exacerbated these acidification problems.

Water quality elsewhere is generally high, with the exception of the Afon Cerist which is contaminated with heavy metals from old mine workings at Fan and contains very few fish. Reclamation works currently underway at the site should improve this situation.

Habitat Quality Most fisheries habitats in the catchment are of high quality, but illegal river works have caused significant damage in some areas, particularly to spawning gravels. Gravels on some rivers, such as the River Vyrnwy and tributaries of the River Tanat, have also become compacted, possibly as a result of land use changes, and less suitable for salmonid spawning as a result. Flood defence and land drainage schemes from earlier years have adversely affected fisheries habitat quality on the Afon Trannon/Cerist and the River Morda.

Illegal Fishing The use of gaffs, spears and, on occasions, nets to take spawning salmon takes place throughout the catchment, and if not controlled could have a significant impact on salmon stocks. Regular patrols, surveillance and checks on potential outlets for the sale of illegally taken salmon are presently carried out by water bailiffs to counter this threat. Out of season salmon fishing also occurs in some areas during the spawning period and changes in byelaws may be needed to combat this problem.

Predation The NRA recognises that in some locations there is concern that cormorants and sawbill ducks may be adversely affecting fish stocks.

RECREATION/AMENITY

General In addition to caravanning, camping, walking, picnicking and the use of Clywedog and Vyrnwy reservoirs for various informal activities, the relatively unspoilt and scenic nature of the catchment encourages an increasing level of tourism.

CURRENT STATE OF THE CATCHMENT

Boating and Water Sports

Other than organised windsurfing, dinghy sailing and canoeing on Clywedog and Vyrnwy reservoirs, there is very little activity within the catchment. Although there is a free right of navigation downstream of Pool Quay on the River Severn, use of the river appears to be limited to a small number of canoeists, with access being generally poor.




FLOOD DEFENCE

A detailed description of flooding problems was first undertaken in 1980 to satisfy Section 24(5) of the Water Act 1973. This has now been updated several times with the most recent update in 1990 (now under Section 105 of the Water Resources Act 1991). The problems are too numerous to identify clearly on a map in this Catchment Management Plan but the breakdown by council is shown in Table 12. A further update is in progress and will include those problems identified subsequent to 1990.

The defined 'Main River' in the catchment is shown on Map 27.



KEY

-  Catchment Boundary
 Main River
 Ordinary Watercourse

CURRENT STATE OF THE CATCHMENT

TABLE 12

FLOODING PROBLEMS (1990 Survey)

District/Borough Council	Total	Main River	Ordinary Watercourse
Montgomeryshire	54	19	35
South Shropshire	3	1	2
Oswestry	2	1	1
Shrewsbury & Atcham	1	-	1
Glyndwr	1	1	-

Code No	Watercourse	Location	Code No	Watercourse	Location
MONTGOMERYSHIRE DISTRICT COUNCIL					
1-86-210-1	Tributary of River Banwy	SH 965 125	1-86-210-32	*Afon Cerist	SN 965 881
1-86-210-3	River Banwy	SJ 083 077	1-86-210-34	River Trannon & Gleiniant Brook	SN 970 905
1-86-210-4	River Vymwy	SJ 069 127	1-86-210-35	Afon Garno	SN 957 978
1-86-210-5	Wig Brook	SJ 076 128	1-86-210-36	Colwyn Brook & Tributary	SO 010 910
1-86-210-7	River Banwy	SJ 134 082	1-86-210-37	Manthrig Brook	SO 037 922
1-86-210-8	Luggy Brook	SJ 199 022	1-86-210-39	Bechan Brook	SO 144 935
1-86-210-9	*River Vymwy	SJ 142 115	1-86-210-40	Lliffior Brook	SO 190 987
1-86-210-10	The Brogan	SJ 143 168	1-86-210-41	Llandyssil Brook	SO 198 952
1-86-210-11	*River Vymwy	SJ 160 129	1-86-210-42	Sarn Brook	SO 187 911
1-86-210-12	Afon Cain	SJ 175 193	1-86-210-43	*River Severn	SO 208 983
1-86-210-13	Afon Cain	SJ 192 208	1-86-210-44	River Caebitra	SO 244 929
1-86-210-14	*River Severn	SJ 229 040	1-86-210-45	Tributary of River Camlad	SO 273 937
1-86-210-15	Coed-y-Dinas	SJ 229 066	1-86-210-47	*Afon Garno	SO 025 917
1-86-210-16	Tributary of River Severn	SJ 230 048	1-86-210-48	River Severn	SN 912 845
1-86-210-17	*River Severn	SJ 219 030	1-86-210-50	*River Camlad	SO 273 947
1-86-210-18	*River Severn	SJ 245 095	1-86-210-51	Acre Brook	SJ 315 160
1-86-210-19	*River Severn	SJ 245 089	1-86-210-52	Wern Llwyd	SJ 230 054
1-86-210-20	*River Severn	SJ 236 069	1-86-210-53	*Guilsfield Brook	SJ 274 156
1-86-210-21	Lledan Brook	SJ 225 076	1-86-210-54	*River Severn	SO 180 955
1-86-210-22	Hem Brook	SJ 241 995	1-86-210-55	Tributary of Sarn Wen Bk	SJ 283 183
1-86-210-23	Bull Dingle Brook	SJ 227 077	1-86-210-56	Tributary of Gwyfer Brook	SJ 279 172
1-86-210-24	Pwll Trewern	SJ 266 115	1-86-210-57	Sarn Wen Brook	SJ 268 184
1-86-210-25	*River Severn	SJ 261 145	1-86-210-58	Un-named	SJ 327 160
1-86-210-26	River Severn	SJ 299 169	1-86-210-59	*River Vymwy	SJ 269 198
1-86-210-28	*River Vymwy	SJ 203 179	1-86-210-60	*River Severn	SO 040 915
1-86-210-29	Tributary of River Vymwy	SJ 209 181	1-86-210-61	Afon Cain	SJ 143 196
1-86-210-30	*River Vymwy	SJ 227 204			
1-86-210-31	*River Severn and River Vymwy	SJ 411 145			
SOUTH SHROPSHIRE DISTRICT COUNCIL			SHREWSBURY & ATCHAM BOROUGH COUNCIL		
1-83-410-5	*River Camlad	SO 249 997	1-83-510-2	America Brook	SJ 375 154
1-83-410-8	Tributary of Aylesford Bk	SJ 274 014			
1-83-410-9	Crankwell Brook	SO 221 990			
OSWESTRY BOROUGH COUNCIL			GLYNDWR DISTRICT COUNCIL		
1-83-310-1	Woolston Brook	SJ 318 243	1-84-110-1	*River Tanat	SJ 150 240
1-83-310-2	*River Morda	SJ 305 245			

* Main River

APPENDICES

FLOOD DEFENCE ROLES**1.1 DURING FLOOD EVENTS****1.1.1 National Rivers Authority**

The NRA forecast likely flood levels, issue warnings to the Police and give advice to the Public. We also patrol main river and remove any blockages, inspect formal flood defences and carry out any necessary remedial works.

The flood warning system is operated on the River Vyrnwy downstream from New Bridge, Meifod and the River Severn downstream from Llandinam.

Warnings are issued for three phases (Yellow, Amber and Red) each of which is associated with increasing flood risk. Details can be obtained from the Upper Severn Area office at Shrewsbury.

1.1.2 Emergency Services***Police***

The Police receive flood warnings from the NRA and disseminate them via a flood warden scheme to those directly at risk and also to the emergency services and Local Authorities. They can also advise on which roads are closed due to flooding.

Fire Service

The fire service provide help in flood emergencies if they are able to do so. The local station will be able to advise the public on what help is, or is likely to be available and whether or not a charge will be made.

RSPCA

This organisation can provide assistance with rescuing animals in danger from floods.

1.1.3 Local Authorities***District Councils***

These have permissive powers to offer assistance (eg. sandbags, moving possessions, evacuation, welfare, drying out etc) during floods. Each Council has a different policy on the amount and type of help they give. Details are available direct from each Council. Some District Councils are involved in dissemination of flood warnings, generally via flood wardens. These systems have been set up by the councils in consultation with the NRA. Flood Wardens are local residents who each contact several other residents to pass on flood warnings.

County Councils

County Councils are the Authorities responsible for Public Highways and any flooding problems associated with road drainage should be referred to them. All County Councils have Emergency Planning Officers who are in some cases involved in running the flood warden system for disseminating warnings and may become involved in more serious flood events. The Councils' Social Services Departments can become involved in providing assistance in the event of evacuation of people from flooded areas.

Water Companies

Public surface water sewerage systems are the responsibility of Water Companies, who sometimes use District Councils as their Agents. Any problems relating to flooding, other than from watercourses, should be directed to the local Water Company.

1.2 GENERAL MATTERS

1.2.1 National Rivers Authority

The NRA's Flood Defence powers are contained in the Water Resources Act 1991, the Land Drainage Act 1991 and the Authority's Land Drainage Byelaws.

The Authority has a supervisory role over all matters relating to land drainage and has a duty whilst carrying out this function to:

"further the conservation and enhancement of natural beauty and the conservation of flora, fauna and geological or physiographical features of special interest". It must also "have regard to the desirability of protecting and conserving buildings, sites and objects of archaeological, architectural or historic interest"

Any work in, over, under or within 8 metres of main river requires the consent of the NRA, as does the construction or alteration of a culvert, mill dam, weir or like obstruction on any watercourse.

The Authority is a statutory consultee of the Local Planning Authorities for statutory plans and planning applications. The Planning Authorities are not obliged to incorporate NRA requirements or comments in their planning decisions but must consider them. It should be noted that control over development in the flood plain, even main river, is through the Planning Act not under Flood Defence legislation.

The NRA has powers to maintain and improve main river watercourses and construct flood defences. Any such work must be both financially viable and environmentally acceptable. The NRA does not carry out erosion protection unless a formal flood defence is likely to be affected.

1.2.2 Local Authorities

Both County and District Councils have powers which relate to and affect the river system.

As stated above they have the power to control development by use of the Planning Act.

In addition they have direct powers under the Land Drainage Act 1991 to take action against riparian landowners, or others, who cause obstructions to watercourses. They are also empowered to carry out watercourse improvements that will benefit the community but need to obtain the NRA's consent for such work.

1.2.3 Riparian Landowners

Riparian landowners are those people who own land adjacent to watercourses. Generally ownership is taken to be up to the centre line of a watercourse, unless deeds show otherwise.

Riparian landowners are responsible for maintaining their watercourses, and under common law may not diminish the flow in terms of quantity nor "throw water back" on upstream landowners.

The obligations of riparian landowners are accompanied by certain "rights" including "The ordinary use of the water flowing past his land" (for cattle watering and domestic purposes), and to pass onto adjacent downstream owners naturally occurring discharges of water.

Erosion is a natural process which can cause significant loss of land. If the landowner wishes to carry out protection work to the river bank, or indeed any alteration to a watercourse, then the NRA must be consulted as a Land Drainage Consent may be required.

GUIDANCE NOTES FOR LOCAL PLANNING AUTHORITIES ON THE METHODS OF PROTECTING THE WATER ENVIRONMENT THROUGH DEVELOPMENT PLANS - JUNE 1993

1.0 INTRODUCTION

1.1 The National Rivers Authority (NRA) was established by the 1989 Water Act as a non-departmental body with statutory responsibilities for water resources, pollution control, flood defence, fisheries, recreation, conservation and navigation in England and Wales. The Authority's Head Office is in Bristol, and there are 8 operational Regions. There is a Chairman's Office in London.

1.2 The aims of the NRA are summarised in its mission statement which reads:

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

1.3 The statutory requirement to manage the water environment has created wide-ranging responsibilities for the Authority. These include the maintenance and improvement of water quality, conserving water resources, providing effective flood defence, improving, maintaining and developing fisheries, promote and further conservation, regulate navigation and generally promoting water-based recreation of all types. The Water Resources Act 1991 requires the NRA to conserve and enhance the water environment when discharging all its duties.

1.4 River catchment management planning provides an essential mechanism for implementing these responsibilities. The broad objective of catchment management planning is to conserve and enhance the total river environment through effective land and resource management. However, while the NRA is well placed to influence some of the factors responsible for the functioning of the hydrological system, particularly in relation to the river corridor itself, it has very little control over the mechanisms which determine land use change on a catchment-wide basis. This is largely the responsibility of local planning authorities through the implementation of the Town and Country Planning Acts.

1.5 The policies in statutory development plans are very important in this regard in that they set out the framework for land use change, and, since the enactment of the Planning and Compensation Act 1991, provide the key reference in determining development applications. The NRA therefore welcomes the inclusion of policies which reflect the Authority's concerns and responsibilities in development plans, including the statutory requirement to conserve and enhance the water environment and associated lands.

1.6 As guidance for local authorities on these matters, the NRA has prepared this set of statements relating to the broad headings of water quality and water resources, flood defence, fisheries, conservation, recreation and navigation in the river corridor, and mineral workings and waste disposal. While most headings reflect NRA functions, minerals and waste disposal have been included as a discrete section reflecting the practice of preparing separate minerals plans and waste plans. Under each heading, issues are described with suggested statements and reasoned justification.

1.7 Two levels of statements are presented. Those shown at the beginning of each section address the wider issues relevant to the preparation of structure plans and Part I of UDPs. These are followed by statements relevant to local plans, or Part II of UDPs.

1.8 It is hoped that the objectives will be substantially replicated in each local authority's land use plans insofar as they are appropriate. The NRA recognises that local circumstances will probably require the modification or omission of various policies. The aim is to assist Chief Planning Officers and their staff by explaining the reasons why it is desirable to include policy statements to protect the water environment, and to provide them with information from which to work. The NRA Planning Officers in each Region are available to provide further advice during plan preparation or review, and at the consultation stage. The NRA will subsequently assist with the implementation of policies where appropriate, either through the consultation process or by the use of its statutory powers and in the execution of its duties. Conversely, the NRA may formally object to development plans which conflict with the stated objectives.

1.9 Once a development plan has been adopted, the NRA will look to reinforce the framework created by the land use policies when commenting on development proposals, draft planning briefs, local planning initiatives and the like. It will also ensure that the activities it itself undertakes; such as granting land drainage consent, implementing river enhancement works etc; are in accordance with policies in development plans.

1

The Water Resources Act 1991 uses the term "controlled waters" to describe the four categories of water for which the NRA has responsibility, ie: "relevant territorial waters", "coastal waters", "inland waters" and "groundwaters". In effect the NRA has jurisdiction over all waters that the general public are likely to encounter

2.0 WATER QUALITY AND WATER RESOURCES STRATEGIC/COUNTY CONCERNS

AIM

2.1 To protect surface, groundwater and coastal water from pollution arising from development.

GUIDANCE STATEMENT

S1 The LPA should normally resist allocation of land for development which, in its opinion after consultation with the NRA, will lead to a deterioration in the quality of underground, surface or coastal water.

JUSTIFICATION

2.2 New development can have significant effects on the quality of surface, underground and coastal water. Therefore the NRA looks to Local Planning Authorities not to permit developments likely to place the quality of watercourses or groundwater at risk.

GUIDANCE STATEMENT

S2 Allocation of land for new development should normally be resisted where the LPA, in consultation with the NRA, considers that adequate water resources do not already exist, or where their provision is considered likely to pose a risk to existing abstractions, water quality, fisheries, amenity, inland navigations or conservation interests.

JUSTIFICATION

2.3 The supply of water to a new development is a critical factor. Development in locations where water resources are already scarce may result in less reliable supplies for existing population and industry, or may result in pressures for further abstraction licences which could put existing abstractions at risk, and may be detrimental to amenity, water quality, fisheries, inland navigations and nature conservation. Developments should be resisted if possible where existing water supplies are inadequate, or where they cannot be augmented in time to coincide with the development without adversely affecting the water environment.

LOCAL/DISTRICT CONCERNS

Waste Water Management

THE ISSUE

2.4 With increasing population and water use nationally, many sewer systems, including sewage treatment works, are becoming overloaded. Further development in the areas served by these systems is likely to lead to the pollution of watercourses unless additional infrastructure is provided. Such pollution poses a serious risk to water quality, water-based recreation, fisheries and nature conservation.

GUIDANCE STATEMENT

L1 New development should not normally be permitted unless foul sewers and sewage treatment works of adequate capacity and design are available or will be provided in time to serve the development. The NRA would look to the LPA to discourage the proliferation of small private package sewage treatment plants and other types of discharge direct to watercourse within sewered areas. The use of septic tanks will only be considered if connection to the mains sewerage is not feasible, and only then if ground conditions are satisfactory and the plot of land is of sufficient size to provide an adequate subsoil drainage system.

JUSTIFICATION

2.5 To ensure adequate infrastructure is available to serve the development. Private sewage plants require regular maintenance at frequent intervals in order to produce effluents which meet their discharge consents. Failure to reach the required standard can result in inadequate dilution of effluents and pollution of the ground or surface waters can result.

-Industrial effluents also pose a significant risk of pollution to surface and ground waters and should, wherever possible, be discharged to the public foul sewerage system.

LOCAL/DISTRICT CONCERNS

Surface Water Protection

THE ISSUE

2.6 The water quality of inland watercourses is an important area of concern for the NRA. This recognises the importance of water quality to a wide range of uses and users, including abstraction for potable supply, industrial water supply, fisheries, livestock watering, spray irrigation, and amenity, including inland navigation, and conservation.

GUIDANCE STATEMENT

L2 The LPA should normally resist development which in its opinion, after consultation with the NRA, could adversely affect the quality of surface, underground or coastal water as a result of the nature of the surface or waste water discharge, or give rise to pollution problems resulting from the disturbance of contaminated land. The NRA will look to the LPA to generally support initiatives which lead to improvements in surface water quality.

JUSTIFICATION

2.7 Maintaining or enhancing the water quality of coastal water, rivers, canals, lakes, ponds and other water bodies is important in order to protect the wide range of uses. The NRA looks to Local Planning Authorities to restrict development which threatens surface water quality, and will generally encourage initiatives that result in an improvement in surface water quality.

Development which disturbs contaminated ground is an additional concern. Unless carefully designed and implemented, such schemes can cause pollution of surface waters. Contaminated sites therefore should be adequately sealed against the leakage of polluted matter, while surface drainage should be directed away from the source of contamination. However, it is also recognised that the development of contaminated sites can offer opportunities for improvements in surface water quality, for instance by the restoration of sites which have been poorly infilled in the past.

LOCAL/DISTRICT CONCERNS**Groundwater Protection****THE ISSUE**

2.8 Groundwater resources are an essential source of water for public supply, industry and agriculture. They also sustain the base flows of many rivers. As a general principle, the NRA supports the conservation of groundwater quality, the aim being to prevent its pollution rather than the subsequent cleaning up of contamination. However, some activities, such as the disturbance of contaminated sites or the inappropriate storage of chemicals can result in the pollution of groundwater. The cleaning up of contaminated groundwater is difficult and expensive. It is better, therefore, to prevent or reduce the risk of groundwater contamination rather than deal with its consequences. Similarly, abstraction and dewatering can affect quantities available, and engineering works can obstruct groundwater flow with an aquifer.

GUIDANCE STATEMENT

L3 Developments should normally not be permitted which, in the opinion of the LPA, after consultation with the NRA, pose an unacceptable risk to the quality of groundwater. Areas subject to different levels of risk and protection are shown on the Proposals Map.

JUSTIFICATION

2.9 To prevent pollution of groundwater by controlling activities, such as the disposal of effluent in soakaways, landfilling of unsealed sites over permeable bedrock, or inappropriate storage of chemicals. Abstraction and dewatering can affect quantities available, and engineering works can obstruct groundwater flow within an aquifer. Guidance on considerations affecting the acceptability of development from a groundwater protection viewpoint has been published by the NRA as its "Policy and Practice for the Protection of Groundwater" (Bristol, December 1992). This includes map-based data showing the constraints on development.

LOCAL/DISTRICT CONCERNS**Availability of Water Resources****THE ISSUE**

2.10 The development of water resources for water supply is becoming increasingly difficult. The NRA is concerned that the provision of water for development does not have a detrimental impact on existing uses. In some areas, over-abstraction has resulted in reduced flow rates in rivers. Further abstraction in such locations will exacerbate this problem. In practice, this allows no significant new all-year-round abstractions, and is therefore an important issue in terms of development control. Consequently, there is a growing need to plan for new strategic water resources which will not harm the environment; these may require the construction of new reservoirs or the expensive transport of water over long distances. This can have a critical impact on the viability or timing of new development.

GUIDANCE STATEMENT

L4 The LPA should not normally permit development which increases the requirement for water unless adequate water resources either already exist or will be provided in time to serve the development and without detriment to existing uses. The NRA looks to the Local Planning Authority to support water conservation measures.

JUSTIFICATION

2.11 Developments should be limited to locations where adequate water resources already exist, or where new provision of water resources can be made without adversely affecting existing abstraction, river flows, water quality, agriculture, fisheries, amenity or nature conservation, and where it coincides with the timing of the development. The NRA intends to publish its National Water Resources Development Strategy by early 1994.

3.0 FLOOD DEFENCE

STRATEGIC/COUNTY CONCERNS

AIM

3.1 To ensure that development is not at an unacceptable risk from flooding (including tidal inundation) and does not put other areas at risk, or greater risk, from flooding which could endanger life and damage natural and built assets. To ensure that any work which is needed to reduce the risk of flooding created by a development is paid for by the developer and not the public.

GUIDANCE STATEMENT

S3 The LPA, after consultation with the NRA, should normally resist allocation of land where such development would be at direct unacceptable risk from flooding (including tidal inundation) or likely to increase the risk of flooding elsewhere to an unacceptable level.

JUSTIFICATION

3.2 New development, redevelopment, and land raising can have significant implications for flood risk. Within river and coastal floodplain, new developments may be liable to flooding and may increase the risk of flooding (including tidal inundation) elsewhere by reducing the storage capacity of the floodplain and impeding flood flows. Development anywhere in the catchment may increase surface water run-off, adding to the flood risk downstream, and may increase the risk of pollution and damage to river habitats. Similarly, development which threatens the stability and continuity of fluvial and tidal flood defences can place large areas at risk from inundation.

LOCAL/DISTRICT CONCERNS

Protection of the Floodplain

THE ISSUE

3.3 Throughout England and Wales, and particularly in urban areas, a considerable amount of development has taken place on the coastal plain as well as in river floodplains. Consequently, people and property in these areas are already at risk from flooding. New development in floodplains is also likely to be at risk from flooding. The NRA holds information identifying many of the areas known to be at risk and will provide such information as required. Development can also have the effect of increasing the risk of flooding elsewhere.

GUIDANCE STATEMENT

L5 Within the identified floodplain or in the areas at unacceptable risk from flooding the LPA should resist new development, the intensification of existing development or land raising. Where it is decided that development in such areas should be permitted for social or economic reasons, then appropriate flood protection and mitigation measures, including measures to restore floodplain or provide adequate storage, will be required to compensate for the impact of development. At sites suspected of being at unacceptable risk from flooding but for which adequate flood risk information is unavailable, developers will be required to carry out detailed technical investigations to evaluate the extent of the risk. In all cases, developers will be required to identify, implement and cover the costs of any necessary measures. In some cases the elements of the necessary measures may be such that they are best undertaken by the NRA itself, but in these cases the cost would be covered by the potential developers.

JUSTIFICATION

3.4 Guidance for Planning Authorities on protection of the floodplain is contained in DOE Circular 30/92 "Development & Flood Risk" (WO 68/92) and guidance on coastal floodplains is contained in PPG20 "Coastal Planning". In addition to the risk of flooding to the proposed development itself, development in such locations may increase the risk of flooding elsewhere by reducing the storage capacity of the floodplain, and/or by impeding the flow of flood water. Land raising in the floodplain may have a similar effect. Consequently, the NRA looks to the LPA to resist development in such locations, while redevelopment of existing sites will only be considered where the LPA, in consultation with the NRA, is satisfied that the developer will provide appropriate mitigation and/or protection measures. There may also be opportunities to enhance or restore the natural floodplain when redevelopment takes place.

LOCAL/DISTRICT CONCERNS**Surface Water Run-off****THE ISSUE**

3.5 Unless carefully sited and designed, new development or redevelopment, can increase the rate and volume of surface water run-off. This can result in two types of problem. The first is the increased risk of flooding in areas downstream from the development in question. The second is physical damage to the river environment. This is a catchment wide issue and the NRA will take a co-ordinated approach to all developments.

GUIDANCE STATEMENT

L6 The LPA should normally resist development which would result in adverse impact on the water environment due to additional surface water run-off. Development which could increase the risk of flooding must include appropriate alleviation or mitigation measures, defined by the LPA in consultation with the NRA and funded by the developer. Developers will be expected to cover the costs of assessing surface water drainage impacts and of any appropriate mitigation works, including their long-term monitoring and management.

JUSTIFICATION

3.6 Guidance for Planning Authorities on dealing with run-off from development is contained in DOE Circular 30/92 "Development & Flood Risk" (WO 68/92). New developments may result in a substantial increase in surface water run-off as permeable surfaces are replaced by impermeable surfaces such as roofs and paving. This may result in an increase in the risk of flooding downstream to an unacceptable level and a reduction in infiltration to groundwater. Other consequential effects include increased pollution, silt deposition, damage to watercourse habitats and river channel instability, as well as reduction in both river base flows and aquifer recharge. These effects can often be at some considerable distance from the new development. The LPA, in consultation with the NRA, will assess the surface water run-off implications of new development proposals. New developments will only be permitted where the LPA is satisfied that suitable measures, designed to mitigate the adverse impact of surface water run-off, are included as an integral part of the development. Where appropriate, the development should include provision for the long term monitoring and management of these measures. Arrangements under S106 of the Town & Country Planning Act 1990 may be appropriate.

LOCAL/DISTRICT CONCERNS**Tidal and Fluvial Flood Defences****THE ISSUE**

3.7 Development in lowlying land protected from flooding by tidal and fluvial defences is at risk of flooding, should the defences be overtopped by extreme water levels. A breach in tidal and fluvial defences could lead to significant flooding in areas of low lying land often well away from the location of the breach. Such an incident could place both people and natural and built assets at risk.

GUIDANCE STATEMENT

L7 Development should not normally be permitted which would adversely affect the integrity and continuity of tidal and fluvial defences. Access to existing and future tidal and fluvial defences for maintenance and emergency purposes will be protected, and where appropriate, improved. Where development relating to tidal and fluvial defences is permitted, the LPA will, in consultation with appropriate bodies including the NRA, require appropriate measures to be incorporated in order to ensure that the stability and continuity of the defences is maintained. Developers will be expected to cover the costs of any appropriate enhancement and mitigation works, including their long-term monitoring and management.

JUSTIFICATION

3.8 Guidance for Planning Authorities on development in flood risk areas is contained in DOE Circular 30/92 "Development & Flood Risk" (WO 68/92) and guidance on coastal floodplains is contained in PPG20 "Coastal Planning". In order to prevent flooding it is essential that local authorities, in consultation with other appropriate bodies including the NRA, ensure that the integrity and continuity of tidal and fluvial defences is maintained. In many cases access to these defences for maintenance and emergency purposes is required together with access for any future improvements. Local authorities should protect, and where appropriate, improve such access. Careful design and siting of flood defences may offer opportunities to increase public access to the waterside or to secure other types of environmental enhancement (for instance, the protection of an important view). In the case of coastal defences, the option of managed retreat should be considered. It is recognised that planning obligations are often a means of achieving such improvements. Developments which pose a threat to the integrity and continuing of tidal and fluvial defences could require the Authority's consent in addition to planning consent and consultation with the NRA is necessary.

L8 In order to minimise the effects of tidal flooding, the LPA should resist development on land to the seaward side of sea defences, including the siting of temporary holiday chalets and caravans. On land between a first line sea defence and the main defence, the siting of holiday chalets, caravans, and camping sites will not normally be permitted. If after consultation with the NRA and other interested bodies the LPA decides that the risk of flooding is sufficiently low to permit certain types of use, time limited occupancy conditions will need to be imposed preventing occupation during the period from November-March inclusive when the risk of tidal inundation is greatest. The development permitted in any area of land subject to a flooding risk must be in line with the level of protection provided by the sea defences which exist. A change in the type of development permitted could result in a need for increasing the level of protection afforded and if so the cost of such provision should be borne by the developer.

3.9 Any development on land to the seaward side of sea defences is obviously at significant risk from flooding. So as to minimise the effects of tidal inundation, the LPA will not normally permit development in such locations. See Circular 30/92 (WO 68/92).

4.0 FISHERIES, RECREATION AND CONSERVATION IN RIVER CORRIDORS AND COASTAL MARGINS

STRATEGIC/COUNTY CONCERNS

AIM

4.1 To consider the effects of development on the water environment so as to minimise its adverse impacts and maximise potential benefits. This is particularly so in river corridors and coastal margins, areas of land which are physically and visually linked to rivers, their estuaries and the coast, in wetlands, around lakes and ponds and in sensitive catchment areas.

GUIDANCE STATEMENT

S4 The LPA, in consultation with the NRA, should normally resist allocation of land for development which is likely to have an adverse effect on fisheries, nature conservation, landscape and recreation in river corridors, coastal margins and other waterside areas. The NRA will look to the LPA to generally promote and support initiatives which seek to conserve, restore or enhance the natural elements of the river corridors, coastal margins and other waterside areas, or which encourage appropriate water-based and waterside recreation.

JUSTIFICATION

4.2 River corridors and coastal margins are of great importance for water resources, nature conservation, fisheries and recreation and often make a significant contribution to the character of the landscape. Rivers, groundwater, ponds, wetlands, appropriate public access and water-related recreation all deserve conservation and restoration and enhancement where appropriate. The NRA is concerned that new development should not place these aspects of the water environment at risk. However, it is recognised that development, or more often redevelopment, can result in an enhancement of the environment of rivers and coastal margins, for instance by increasing public access, improving water-related habitats, landscape or water quality or by securing the restoration of natural features. The improvement of water-related habitats and water quality is likely to have a beneficial effect on the fish population.

LOCAL/DISTRICT CONCERNS

River Corridors and Coastal Margins

THE ISSUE

4.3 The NRA, in its role as 'Guardian of the Water Environment', aims to encourage policies which:

- further the conservation and enhancement of the natural environment;
- promote facilities for recreation, including public access;
- further the conservation and enhancement of the built environment, sites and objects of archaeological, architectural or historic interest.

4.4 By emphasising the importance of river corridors and coastal margins, the NRA aims to promote these three aspects of the river environment. Such a corridor is a continuous area of land which is physically and visually linked to the watercourse itself. A coastal margin is similarly an area of land physically and visually linked to the coast and any coastal defences. Studies have shown that there is a high correlation between river corridors in England and existing environmental designations, notably SSSIs and Areas of Outstanding Natural Beauty. In urban areas, the importance of river corridors is even more pronounced since they represent one of few remaining features which link areas of open space. Such links are significant for amenity and recreation, but also for wildlife, allowing otherwise isolated areas to be interconnected and more viable in terms of animal and plant populations and habitat types. These factors suggest that river corridors warrant reference in land use plans as important elements which link areas of open space together.

GUIDANCE STATEMENT

L9 The LPA, in consultation with the NRA, should seek to promote river corridors and coastal margins as important areas of open land by:

- conserving existing areas of value and wherever possible seeking to restore the natural elements within the corridors and margins;

- promoting appropriate public access;
- identifying appropriate locations for water related recreation;
- protecting and improving access for operational and maintenance purposes, including the provision of maintenance strips where practical;
- resisting development which would have an adverse impact on nature conservation, fisheries, landscape, public access or water-related recreation.

JUSTIFICATION

4.5 In addition to their drainage function, river corridors are of great importance for water resources, water quality, nature conservation, fisheries, recreation and that they often make a significant contribution to the character of the landscape. Coastal margins including areas adjacent to coastal defences can be similarly valuable. In many instances river corridors are an important source of open space in their own right, but frequently also form links or 'green chains' between areas of open space, often across borough boundaries. These links can be crucial for the survival or enhancement of wildlife. The NRA is committed to the protection, and wherever possible, enhancement of rivers, groundwater, ponds, wetlands, and appropriate public access and water-related recreation. Consequently, the NRA looks to Local Planning Authorities to support initiatives and proposals which will result in the conservation or enhancement of the natural elements of the river and coastal environment. Planning obligations are an important means of securing such improvements.

LOCAL/DISTRICT CONCERNS

Implementing the Strategy for River Corridors and Coastal Margins

THE ISSUE

4.6 All types of work in, under, over and adjacent to rivers, lakes, ponds and the coast need to be properly evaluated since uncontrolled works may lead to damage to the water environment.

GUIDANCE STATEMENT

L10 The LPA, in consultation with the NRA, should seek to ensure that all works in, under, over and adjacent to watercourses, waterbodies and the coast are appropriately designed and implemented and that the likely impacts of development proposals have been adequately assessed by means of a formal Environmental Assessment, where appropriate. In all cases proposals will need to be accompanied by an environmental report so that environmental impacts can be appraised.

JUSTIFICATION

4.7 Uncontrolled works in the vicinity of watercourses may lead to problems such as an increased risk of flooding, erosion of the beds and banks of watercourses, waterbodies and the coast; increased danger to the public; restricted access for maintenance; and damage to the water environment and the associated river corridor. Consequently, the NRA will assess the environmental impact of such proposals on the water environment. Mitigation measures will be required to balance any adverse impacts. The culverting of watercourses will not normally be permitted since it results in a break in the continuity of the river corridor and may also have serious implications for safety, maintenance and flooding. The granting of planning permission for the above works does not remove the need to obtain relevant statutory consents/licences from the NRA, for which implications for the aquatic environment will be assessed. The NRA can offer guidance on these matters.

LOCAL/DISTRICT CONCERNS

Navigation

THE ISSUE

4.8 Specific Acts grant navigation powers to the NRA in some Regions where it controls various river navigations and harbours. In addition, the NRA has by-law making powers in respect of inland waterways in England and Wales, where there is a public right of navigation but no other authority legitimately exercises navigation powers. In such cases, the NRA's responsibilities include overseeing river based activities, licensing, conducting boat safety inspections and managing locks.

Rivers are an important recreational resource and the NRA recognises the contribution they can make to a community in terms of social and economic benefit. The development of new facilities (eg. moorings, slipways) can have an effect not only on the immediate location, but also throughout the navigation. Development proposals should be considered in the context of the whole navigation to achieve a balance between encouraging development and protecting the resource. NRA staff can provide advice about a catchment, upon which a strategic assessment of proposals can be based. Where possible, and in conjunction with Local Authorities and the relevant navigation authority, the NRA will encourage and support the production of Recreation Strategies for river navigations.

In some areas, riverside land is being redeveloped to provide housing, offices or some other on river related use. This can lead to the loss of important facilities such as boatyards, slipways, access and open spaces. Where possible, riverside developments which destroy key facilities should be resisted or mitigation works should be required. Access to the riverside and riverside footpaths should be retained.

GUIDANCE STATEMENT

L11 The LPA, in consultation with the NRA, should generally support proposals for the development of the recreational, leisure and tourist potential of river navigations where this is consistent with the capacity of the river and does not jeopardise other recreational activities, local amenity or conservation value. Wherever possible, when it is agreed that water based activities are an appropriate after-use, encouragement will be given to locate new moorings and relocate existing on-river facilities to off-river basins and worked out mineral sites.

JUSTIFICATION

4.9 The development of river navigations is largely dependant upon the provision of land-based facilities. The NRA will consider the merits of each application on a site-by-site basis, and also in terms of impact and benefits that will accrue throughout the navigation. When considering moorings, off-river schemes will be favoured as they do not constrict the navigation channel or obstruct the river bank. They can also result in the creation of additional off-river areas which are of benefit to fish and wildlife. Riverside developments can have a significant visual impact and will be required to make a positive contribution to the landscape value and local characteristics of the area. Rivers are a natural resource and are of value and attraction to a broad cross section of society. Existing public access to the riverside should be protected and, wherever possible, opportunities for increased access points, riverside viewing points and riverside footpaths should be encouraged.

5.0 MINERAL WORKINGS AND WASTE DISPOSAL

STRATEGIC CONCERNS

AIM

5.1 To reduce the negative impacts on the water environment of mineral workings and their after use, including subsequent infilling with waste, and to maximise the environmental benefits associated with site restoration.

GUIDANCE STATEMENT

S5 The LPA should normally resist proposals for new mineral extraction or waste disposal sites where, after consultation with the NRA, it considers that there would be adverse effects on groundwater, rivers or other water bodies.

S6 The LPA should generally support initiatives, including site restoration proposals, which result in benefits relating to the water environment, and improvements in the standard of flood protection.

JUSTIFICATION

5.2 Mineral extraction and the restoration of sites can raise a number of environmental issues. The extraction process, if it involves dewatering of workings, can lower groundwater levels around a site, possibly affecting flows in nearby watercourses and levels in nearby lakes, existing water abstractions and natural habitats. In some cases these effects can be over distances of several kilometres. The necessary mitigation of these adverse effects can sometimes be provided by appropriate design. In addition, the restoration of worked-out mineral sites may increase the possibility of flooding if they are located within the floodplain, and involve landraising or doming. Landfilling floodplain sites with putrescible waste increases the risk of pollution. However, the NRA also recognises that the restoration of worked-out mineral sites may offer opportunities for environmental enhancement, the provision of water based recreation or flood protection.

MINERALS PLANS/PART II OF UDPS

THE ISSUES

5.3 Mineral extraction can affect water resources, flood risk and the environment, if appropriate measures are not taken. Conversely, restoration works may offer opportunities for environmental enhancement, the provision of water based recreation or flood protection measures.

GUIDANCE STATEMENT

L12 The LPA should normally resist proposals for new mineral workings whose impact on surrounding groundwater levels is likely to have a detrimental effect on existing water abstraction, river flow, lake levels, or natural habitats.

JUSTIFICATION

5.4 Mineral extraction may have the effect of temporarily and in some cases for a prolonged time reducing groundwater levels in the area surrounding a site and up to some significant distance away. This may reduce flows in surrounding watercourses, reduce levels in adjacent lakes, affect existing water abstractions, or damage natural habitats.

5.5 Restoration of previously worked mineral sites may involve the raising of ground levels or the doming of sites. Such works may reduce the capacity of the floodplain, thereby increasing the flood risk in other areas. Planning consent should only be granted for this type of restoration where works elsewhere in the floodplain will provide appropriate alleviation or mitigation measures to compensate for the reduced capacity. Furthermore, backfilling with impermeable materials can lead to raised groundwater levels upstream, in turn leading to localised

waterlogging and groundwater flooding. Similarly, groundwater levels can be lowered downstream leading to derogation of watercourses, existing abstractions and natural habitats.

5.6 However, sites which remain as open water may offer opportunities for the provision of routes for flood water, habitat creation, recreation provision, landscape enhancement and improved water resource availability.

GUIDANCE STATEMENT

L13 The LPA should not normally grant planning consent for mineral workings in floodplains where such workings could result in raising of existing ground levels, either during the operational life of the works or after restoration. Permission may exceptionally be granted where the LPA, in consultation with the NRA, is satisfied that flood compensation is provided elsewhere in the floodplain. Where restoration involves landfilling, care will be taken to ensure that the proposals do not affect groundwater quality and levels or impede flow paths.

JUSTIFICATION

5.7 If the restoration of disused mineral workings raises the ground level of a site within the floodplain, the capacity of the floodplain may be reduced, and the flow of flood water impeded, thus increasing the risk of flooding elsewhere. In addition, backfilling with impermeable materials can lead to raised groundwater levels upstream, in turn leading to localised waterlogging and groundwater flooding.

GUIDANCE STATEMENT

L14 The LPA should generally support and encourage restoration proposals for worked-out mineral sites, and restoration of related waste disposal sites which have been poorly restored in the past.

JUSTIFICATION

5.8 The restoration of worked-out mineral sites can present opportunities for environmental enhancement. In some locations, the retention of areas of open water may be appropriate, allowing the provision of routes for flood water, habitat creation, new or improved fisheries, recreation provision, improved water resource provision and landscape enhancement. The NRA will therefore generally support appropriate environmental enhancement as an element of site restoration including the proper restoration of sites which were poorly restored in the past. Conditions may be attached to new planning consents to this end.

WASTE PLANS/PART II OF UDPS

THE ISSUE

5.9 The disposal of waste, either by landfilling of disused mineral workings, or by land raising in the floodplain, presents a number of issues of concern to the NRA. The first is the reduction of the capacity of the floodplain itself. The second is the risk of pollution. Thirdly, raising of ground levels within the floodplain (for example by the doming of sites).

GUIDANCE STATEMENT

L15 Disposal of waste within the floodplain should be restricted to inert waste only. The LPA should not normally permit waste disposal which results in a raising of ground levels within the floodplain. Elsewhere, the disposal of putrescible waste should not be permitted where it is likely to lead to the pollution of groundwater or surface water.

JUSTIFICATION

5.10 The deposition of putrescible waste increases the risk of pollution for surrounding groundwater and surface water. The risk is greatest within the floodplain where disposal should be limited to inert waste only. Elsewhere, the disposal of putrescible waste should be limited to locations where there is no risk to groundwater or surface water quality. An additional problem is the risk of flooding that may result from waste disposal which involves the raising of ground levels or the doming of sites within the floodplain, since this can reduce the capacity of the floodplain to store water, and may impede the flow of floodwater. Guidance on considerations affecting the acceptability of development from a groundwater protection viewpoint has been prepared by the NRA in "Policy & Practice for the Protection of Groundwater" (Bristol Dec.92). This includes map-based data showing the constraints on development.

A: THE BIOLOGICAL COMPONENT OF THE GENERAL QUALITY ASSESSMENT SCHEME**THE NEED FOR BIOLOGICAL GRADING**

The health of rivers is reflected in the variety and abundance of animal and plant life that they support. Operating alone, the chemistry component of the GQA might allow a river to achieve a good grading but still have poor biology because of factors such as:

- pollution caused by the impact of mining, contaminated land and certain types of industrial discharge;
- intermittent pollution not detected by routine sampling for chemical analysis; or,
- the effect of acid deposition.

It might be thought that some of these effects could be overcome by including a large number of extra chemicals in the definition of the chemical grading. However, the cost alone prohibits undertaking the analysis of all these chemicals everywhere, and the need continually to add new standards would undermine the chemical grading as a measure of absolute quality and change.

To provide a more comprehensive picture of the health of rivers and canals in the future, a benthic biological grading will be reported in parallel with the chemical grading. The biological grading will be based on the monitoring of small animals which live in or on the bed of the river - the benthic macro-invertebrates. Each species thrives best under a narrow range of environmental conditions. The status of benthic macro-invertebrates communities therefore reflects the extent to which rivers are affected by environmental stresses, the major one of which is pollution. Because these communities take months or even years to recover, following pollution episodes, they reflect the pollution history at a particular site, providing evidence of pollution which may not have been detected through the routine sampling programme for the chemical quality assessment. Thus they provide a valuable additional 'window' through which the state of the water environment can be viewed.

SUMMARY MEASURES OF BIOLOGICAL QUALITY

One way to simplify the information on the variety of macro-invertebrate taxa found at any site is to reduce it to a small number of summary measures. In the United Kingdom there are two thousand different species of aquatic invertebrates which are grouped into classes and families. These groupings are called taxa. A key piece of information provided by monitoring is the number of different taxa found at a site. A high Number of Taxa is itself a general indication that water quality is good.

Some animals are more susceptible than others to pollution and the presence of the more sensitive creatures is also a sign that water quality is good. The fact was taken into account in 1979 by the Biological Monitoring Working Party (BMWP), when it developed a method of summarising biological information in the form of a simple index. This became known as the BMWP Score.

The BMWP system assigns points to particular taxa according to their sensitivity to pollution. The most sensitive taxa, such as stone-flies, score ten, the less sensitive taxa, like freshwater shrimps, score five, while the most pollution insensitive oligochaete worms score one. Approximately eighty different taxa make up the BMWP system, each scoring between one and ten. The BMWP Score for a site is the sum of all the scores of the taxa found in standard samples. The weightings in the BMWP Score specifically reflect the impact of organic pollution such as that from sewage effluents and farms.

A third summary statistic, the Average Score per Taxon, ASPT, is the BMWP Score divided by the Number of Taxa. This attempts to give a measure of the average sensitivity to pollution of the taxa found at a site.

Water quality is only one of the many factors that influence the status of benthic macro-invertebrate communities. The characteristics of communities differ in different rivers across the country according to a

range of natural features such as geology, altitude and temperature. The communities also differ in relation to more local influences such as river width and depth, and the nature of the river bed. The consequence of this is that in the past it has been difficult to compare the status of macro-invertebrates across the country because of the difficulties in separating the influence of water pollution from other quite natural factors.

The development of a computerised predictive tool called RIVPACS (River Invertebrate Prediction and Classification System), developed by the Institute of Freshwater Ecology, provides a promising way forward in developing a biological grading system for assessing macro-invertebrate community status on a common basis across the country. It allows predictions to be made on the type of community that would be expected according to a range of natural features assuming the river is not affected by pollution. It is then possible to compare this prediction with the actual community status to provide a measure of the extent to which the river is affected by pollution. The ratio of observed to predicted community status can be expressed as a quotient, termed the Ecological Quality Index (EQI). For example, using the BMWP Score as a measure of community status, the EQI is calculated as follows:

$$EQI_{BMWP} = \frac{\text{BMWP Score observed by monitoring}}{\text{BMWP Score predicted by RIVPACS}}$$

EQIs can be expressed in the same way for the ASPT and the Number of Taxa.

A value for the EQI of approximately unity indicates that the biological communities found in the river are those that would be expected under conditions of natural water quality. Lower values indicate that the biota may be stressed by pollution drought or other causes.

QUALITY GRADES

The method currently used for the biological grading of rivers and canals is defined by the EQIs for each of the three summary measures: BMWP Score, Average Score per Taxon (ASPT) and Number of TAXA. Although these three measures are all related (ASPT is the quotient of the BMWP Score and Number of Taxa) they provide different ways of assessing the information contained within a biological sample and so it is often more informative to consider all three together. Under this system there are only four grades; the grade-limiting criteria are summarised in the table below. At this stage however these criteria and the actual number of grades are largely illustrative. It should be noted that these do not correspond to chemical grades A,B,C etc.

The grade widths have been calculated statistically not biologically, because rivers are a continuum there are not obvious boundaries in the data. However there is likely to be a broad correlation between the general terms Good, Fair, Poor and Bad between the biological and chemistry components of the GQA.

The Biological Grading System

Water Quality	Grade	EQI_{ASPT}	EQI_{TAXA}	EQI_{BMWP}
Good	a	≥ 0.89	≥ 0.79	≥ 0.75
Fair	b	≥ 0.77	≥ 0.58	≥ 0.50
Poor	c	≥ 0.66	≥ 0.37	≥ 0.25
Bad	d	< 0.66	< 0.37	< 0.25

For a typical biological sampling site, three biological samples are taken in a year - in Spring, Summer and Autumn. The results from these three samples are combined to produce, in effect, a single measure for the whole sampling period, in this case one year. A site is placed in a grade by calculating the values of the three EQIs and assigning a grade for each based on the criteria set out in the Table above. The three individual grades are then arranged in rank order, from a to d. The overall biological grade is then determined by:

- the EQI_{ASPT} where this is ranked lowest; or,
- where this is not the case, the middle ranking EQI.

The consequent of the adoption of this procedure is that the overall biological grade is never 'better' than the grade given by EQI_{ASPT} alone. This reduces the possibility that the biological quality of a stretch of water could be made to look better than it should by incorrect sampling techniques, such as sampling for longer specified in the standard procedures, because ASPT is much less affected by variations in the amount of effort put into sampling than the Score or Number of Taxa.

B: THE CHEMISTRY COMPONENT OF THE GENERAL QUALITY ASSESSMENT SCHEME

The basic chemical grade of the GQA Scheme is defined by standards for the concentrations of BOD, ammonia and dissolved oxygen. These have been selected because they are indicators of the extent to which waters are affected by wastewater discharges and rural land use run-off containing organic, degradable material. The quality of many of our rivers and canals is affected by such discharges which include effluents from sewage treatment works and industries and drainage from farms. These three simple determinands are therefore the best overall basic chemical measure of river water quality for the purposes of the GQA which will apply to all rivers and canals within the classified network.

GQA Chemical Grading for Rivers and Canals

		Dissolved Oxygen	Biochemical Oxygen Demand (ATU ¹)	Ammonia
Water Quality	Grade	(% saturation) 10-percentile	(mg/l) 90-percentil	(mgN/l) 90-percentile
Good	A	80	2.5	0.25
	B	70	4	0.6
Fair	C	60	6	1.3
	D	50	8	2.5
Poor	E	20	15	9.0
Bad	F ²	-	-	-
¹ as suppressed by adding allyl thio-urea				
² ie quality which does not met the requirements of grade E in respect of one or more determinands.				

The summary of the grade-limiting criteria is given in the Table above. The overall grade assigned to a river or canal reach is determined by the worst of the three grades for the individual determinands.

APPENDIX 3

The new grades are defined in terms of the 90 percentile for BOD and ammonia and the 10 percentile for dissolved oxygen; in other words, the river reach should contain less than the specified levels of BOD and ammonia for at least 90 percent of the time, whilst the level of dissolved oxygen must not fall below the prescribed level for more than 10 percent of the time.

Percentiles have the advantage that they combine a measure of the general level of a determinand with a measure of variability and hence are able to respond to the large fluctuations in quality common in rivers, as well as indicating the overall quality.

National Environmental Quality Standards for List II Substances DOE Circular 7/89

		Lead	Chromium	Zinc	Copper	Nickel	Arsenic
Fresh Water							
Direct abstraction to potable supply	A1	50PT	50PT	3000PT	20PT	50PT	50PT
	A2	75MT	75MT	5000PT	50PT	50PT	50PT
<i>Total hardness mg/l CaCO₃</i>							
Protection of sensitive aquatic life (eg salmonid fish)	0-50	4AD	5AD	8AT(30P)	1AD(5P)	50AD	50AD
	50-100	10AD	10AD	50AT(200P)	6AD(22P)	100AD	50AD
	100-150	10AD	20AD	75AT(300P)	10AD(40P)	100AD	50AD
	150-200	20AD	20AD	75AT(300P)	10AD(40P)	150AD	50AD
	200-250	20AD	50AD	75AT(300P)	10AD(40P)	200AD	50AD
	250+	20AD	50AD	125AT(500P)	28AD(112P)	200AD	50AD
Protection of other aquatic life (eg cyprinid fish)	0-50	50AD	150AD	75AT(300P)	1AD(5P)	50AD	50AD
	50-100	125AD	175AD	175AT(700P)	6AD(22P)	100AD	50AD
	200-250	250AD	250AD	250AT(1000P)	10AD(40P)	200AD	50AD
	250+	250AD	250AD	500AT(2000P)	28AD(112P)	200AD	50AD
Salt Water							
Protection of salt water life		25AD	15AD	40AD	5AD	30AD	25AD
		Boron	Iron	pH	Vanadium		
Fresh Water							
Direct abstraction to potable supply	A1	1000PT	300PD	6.5-5.8P	<i>Total hardness (as mg/l CaCO₃)</i>		
	A2	1000PT	2000PD	5.5-9.0P			
Protection of sensitive aquatic life (eg salmonid fish)		2000AT	1000AD	6.0-9.0P		0-200 200+	20AT
Protection of other aquatic life (eg cyprinid fish)		2000AT	1000AD	6.0-9.0P		0-200 200+	20AT 60AT
Salt Water							
Protection of salt water life		7000AT	1000AD	6.0-8.5P			100AT
		Mothproofing Agents					
		PCSD ₂₀	Cyfluthrin	Sulcofuron	Fluocifuron	Permethrin	
Fresh Water							
Direct abstraction to potable supply	A1		0.001PT				0.01PT
	A2		0.001PT				0.01PT
Protection of sensitive aquatic life (eg salmonid fish)		0.05PT	0.001PT	25PT	1.0PT		0.01PT
Protection of other aquatic life (eg cyprinid fish)		0.05PT	0.001PT	25PT	1.0PT	0.01PT	
Salt Water							
Protection of salt water life		0.05PT	0.001PT	25PT	1.0PT		0.01PT

APPENDIX 4

	Triorganotin Compounds			
		Tributyltin	Triphenyltin	
Fresh Water				
Direct abstraction to potable supply	A1	0.02MT	0.09MT	All values given as microgrammes per litre.
	A2	0.02MT	0.09MT	
Protection of sensitive aquatic life (eg salmonid fish)		0.02MT	0.02MT	A=Annual average
				P=95per cent of samples
Protection of other aquatic life (eg cyprinid fish)		0.02MT	0.02MT	M=Maximum Allowable Concentration
Salt Water				D= Dissolved
Protection of salt water life		0.002MT	0.008MT	T=Total
				(1)=polychloro chloromethyl sulpharamido diphenyl ether (PCSD)

GROUNDWATER OBSERVATION POINTS

Monitoring Point	Type	Ref No	Grid Ref (SJ)	Aquifer	Groundwater Unit	Start of Record	Recording Method
Fox Hall	BH	2011	3220 2570	SS	Knockin	1979	MD
Weir Brook	BH	414	3510 2430	SS	Knockin	1978	MD
Wilcott MOD	BH	429	3780 1890	SS	Knockin	1977	MD
Crofts Mill Bridge	BH	8028	3057 2495	SS	Knockin	1992	MD
Morton Park	GB	8026	3019 2401	D	Knockin	1992	MD
Morton Park	TW	8025	3044 2401	D	Knockin	1992	MD
Morton Park	BH	8027	3023 2402	SS	Knockin	1992	MD
Waen House	BH	6681	3225 2225	SS	Knockin	1983	MD
Pentre Perfa	BH	6682	3045 2027	D	Knockin	1982	MD
Oaklands	BH	6683	3110 1965	D	Knockin	1982	MD
Argoed 1	TW	6685	3301 2080	D	Knockin	1982	MD
Argoed 2	TW	6686	3259 2048	D	Knockin	1982	MD
Knockin Hall	BH	6687	3407 2204	SS	Knockin	1982	MD
Nesscliffe Army Camp	TW	2257	3761 1808	D	Knockin	1986	MD
Wilcott Marsh	BH	430	3750 1755	SS	Knockin	1986	MD
Hilly Farm	TW	2267	3713 1729	D	Knockin	1987	MD
Churncote	BH	6675	4420 1352	SS	Alberbury	1986	DL
Bicton House	BH	6672	4430 1470	SS	Alberbury	1986	MD
Little Shrawardine	BH	6679	3931 1499	SS	Alberbury	1990	MD
Siml Holdings	BH	6680	4065 1365	SS	Alberbury	1990	MD
Ensdon	BH	2250	4093 1642	SS	Ensdon	1988	DL
Ensdon	BH	2282	4092 1731	SS	Ensdon	1989	DL
Folly Pool	GB	2013	3888 1686	D	Ensdon	1979	MD
Folly Farm	BH	2248	3896 1704	SS	Ensdon	1987	MD
Felton Butler	TW	2015	3940 1740	D	Ensdon	1979	MD
Felton Butler SI	TW	2253	3998 1722	D	Ensdon	1986	MD
Felton Butler SI	BH	2249	3994 1725	SS	Ensdon	1982	MD
Laundry Cottage	BH	2246	3952 1836	D	Ensdon	1976	MD
Rodefern Abs	BH	2281	4046 1820	SS	Ensdon	1991	DL
Little Ensdon	BH	2245	4144 1778	SS	Ensdon	1981	MD
Cottage Pool	GB	2007	4193 1817	D	Ensdon	1975	MD
Cottage Pool 1	TW	2005	4193 1819	D	Ensdon	1978	MD
Cottage Pool 2	TW	2006	4176 1820	D	Ensdon	1979	MD
Beam House	TW	2274	4110 1826	D	Ensdon	1988	MD
Nib Heath Abs	BH	2275	4203 1819	SS	Ensdon	1988	DL
Nib Heath Pilot	BH	2242	4210 1820	SS	Ensdon	1987	DL
Warner SI	BH	2290	4200 1875	SS	Ensdon	1991	MD
Knolls 1	BH	2277	4226 1745	SS	Ensdon	1988	DL
Knolls 2	BH	2278	4231 1751	SS	Ensdon	1991	DL
The Knolls	BH	214	4227 1733	SS	Ensdon	1977	MD
Ensdon House	BH	2256	4165 1707	SS	Ensdon	1986	MD
Forton Farm	BH	2233	4297 1606	SS	Ensdon	1987	MD
Forton	BH	2276	4313 1619	SS	Ensdon	1988	DL

BH : Borehole SS : Permo-Triassic Sandstone MD : Manual Dip
 GB : Gaugeboard D : Drift DL : Data Logger
 TW : Tubewell

List of Organisations responding to Issues Consultation

ADAS
Birmingham Anglers Association
British Waterways
Campaign for Protection of Rural Wales
Clwyd-Powys Archaeological Trust
Country Landowners Association
Countryside Council for Wales
Development Board for Rural Wales
English Nature
Forest Enterprise
Inland Waterways Association
Meirionnydd District Council
Ministry of Agriculture, Fisheries and Food
Montgomery Waterway Restoration Trust
North West Water Ltd.
Radnorshire District Council
Royal Society for The Protection of Birds
Severn Fisheries Consultative Council
Snowdonia National Park
South Shropshire District Council
Welsh Office Agriculture Department

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| NRA | 1993 | NRA Flood Defence Strategy. |
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NRA	1993	Regional Fisheries Strategy. Severn-Trent Region.
NRA	1993	Regional Water Resources Strategy. Severn-Trent Region.
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NRA	1994	The Quality of Rivers and Canals in England and Wales (1990 to 1992), Water Quality Series No.19.
NRA	1994	Water Quality Objectives : Procedures Used by the National Rivers Authority for the Purpose of the Surface Waters (River Ecosystem) (Classification) Regulations 1994.
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Severn-Trent Water Authority	1980	A Study of Low Flows in the Severn and Trent Catchments.
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Shropshire County Council	1993	Shropshire County Structure Plan 1989-2006.
Water Resources Board	1973	Water Resources in Wales and the Midlands.

GLOSSARY

Abstraction	The removal of water from any source, either permanently or temporarily.
Abstraction Licence	An authorisation granted by the NRA to allow the removal of water from a source of supply.
Acidification	The detrimental effect of acid rain on soils and freshwater.
Algae	Microscopic (sometimes larger) plants, which may be floating or attached. Algae occur in still and flowing water.
Ammonia	A chemical compound found in water often as a result of pollution by sewage effluents. It is widely used to determine water quality. Ammonia detrimentally affects fish.
AMP2	An acronym for the second Asset Management Plan produced by the Water Companies for the Office of Water Services (OFWAT). It sets out the water industry investment programme for the period 1995 to 2005.
AOD (Above Ordnance Datum)	Land levels are measured relative to the average sea level at Newlyn in Cornwall. This average level is referred to as 'Ordnance Datum'. Contours on Ordnance Survey maps of the UK show heights in metres above Ordnance Datum.
Aquifer	A porous water-bearing underground formation of permeable rock, sand or gravel capable of holding significant quantities of water.
Argae	Flood embankment.
Attenuation	Breakdown or dilution of a contaminant in water.
Augmentation	The addition of water to a watercourse under artificial control. Usually to 'top up' low flows in summer by either groundwater pumping or via reservoir release.
Base Flow	The flow in a river derived from groundwater sources.
Base Poor Soils	Soils which only very slowly release into the water the dissolved chemical or minerals which normally result in a hard water. They are therefore unable to neutralise the effects of acid rain.
BOD (Biochemical Oxygen Demand)	A measure of the amount of oxygen consumed in water (over 5 days), usually by organic pollution. Oxygen is vital for life so the measurement of the BOD tests whether pollution could affect aquatic animals.
CCW	Countryside Council for Wales.
Coarse Fish	Freshwater fish other than salmon and trout.
Confluence	The point at which two rivers meet.
Cyprinid Fish	Coarse fish belonging to the carp family, like roach, dace and bream.
Dangerous Substances	Substances defined by the European Commission as in need of special control. This is because they are toxic, accumulate and concentrate in plants and animals, or do not easily break down into less dangerous substances. They are classified as List I or List II.

GLOSSARY

Demand Management	The management of the total quality of water abstracted from a source of supply using measures to control waste and consumption.
DO (Dissolved Oxygen)	The amount of oxygen dissolved in water. Oxygen is vital for life so this measurement is an important test of the health of a river.
DoE	Department of the Environment.
Dry Weather Flow	For sewage works, this is calculated by adding estimates of the domestic sewage discharge (which is the population multiplied by the per capita consumption) plus any industrial discharges plus infiltration in to the sewer. For the river, the Dry Weather Flow is taken to be what is known as the 95 percentil flow (or Q95) which means the river is higher than Q95 for 95 percent of the time.
EC Directive	A type of legislation issued by the European Community which is binding on Member States in terms of the results to be achieved but which leaves to Member States the choice of methods.
Ecosystem	A functioning, interacting system composed of one or more living organisms and their effective environment, in biological, chemical and physical sense.
Effluent	Liquid waste from industrial, agricultural or sewage plants.
EN	English Nature.
Environmental Quality Standard (EQS)	That concentration of a substance which must not be exceeded if a specific use of the aquatic environment is to be maintained.
Evapotranspiration	Water lost by evaporation and water taken up and lost by plants.
Fauna	Animal life.
Flood Plain	Land adjacent to a watercourse that is subject to flooding.
Flora	Plant life.
Gauging Station	A site where the flow of a river is measured.
Groundwater	Water held in aquifers.
Groundwater Units	Administrative sub-divisions of aquifers, defined on geological and hydrogeological criteria, which form the basis for groundwater resource management and licensing policy decisions.
Habitat	The customary and characteristic dwelling place of a species or community.
Hydraulic Continuity	The degree of interconnection between two potential sources of water, eg a river and an aquifer or two clearly defined aquifers.
Hydrology	The study of water on and below the earths surface.
Landfill	Site used for waste disposal into/onto land.

GLOSSARY

Leachate	Liquor formed by the act of leaching.
Leaching	Removal of soluble substances by action of water percolating through soil, waste or rock.
MAFF	Ministry of Agriculture, Fisheries and Food.
Main River	The watercourses shown on the statutory 'Main River maps' held by NRA and MAFF. The NRA has permissive powers to carry out works of maintenance and improvement on these rivers.
MI/d	Megalitres per day (one Megalitre is equal to 1 million litres or approximately 220,000 gallons).
NRA	National Rivers Authority.
Ordinary Watercourse	A watercourse that does not form part of a Main River.
Orographic Rainfall	Rain which is caused by mountains standing in the path of moisture - laden air. Air is forced to rise, thereby cooled and rain is deposited on high ground.
Piscivorous	Feeding on fish.
Potable Water	Water of quality suitable for drinking.
Prescribed Flow	A flow set to protect lawful downstream users and the aquatic environment.
Prime Sites	Sites of importance for nature conservation, designated by County Wildlife Trusts and in some cases EN and Local Authorities. Non statutory.
Q95	The flow of a river which is exceeded on average for 95% of the time.
Reach	A length of a river.
Red Data Book Species	The most threatened species in Great Britain.
Regulated River	A river where the flow is augmented through the addition of water from another source.
Renewable Energy	Energy produced from resources which are unlimited or rapidly replenished eg. Wind, water, sunlight, wave power or waste.
Riparian	Of, or on, land contiguous to the river.
River Corridor	A term which describes a stretch of river, its banks, and a varying amount of adjacent land that is affected by the presence of the river.
Salmonid Fish	Game fish of the Salmon family, for example, trout and salmon.
Scheduled Ancient Monument (SAM)	The key sites nationally for archaeology, designated by the Secretary of State for National Heritage, through English Heritage and Cadw. Statutory; designated under the Ancient Monuments and Archaeological Areas Act 1979.

GLOSSARY

Sherwood Sandstone	A thick sequence of poorly cemented red-brown sandstones with interbedded marls and conglomerates deposited during the Triassic era, and constituting one of the main aquifers in the British Isles.
Shropshire Groundwater Scheme	A river augmentation scheme designed to supplement flows in the River Severn during prolonged drought conditions. Groundwater from the Permian Bridgnorth and Triassic Sherwood Sandstone formations of North Shropshire is pumped, via a phased network of interlinked abstraction boreholes, and discharged directly into the River Severn and its main tributaries.
Soakaway	System for allowing water or effluent to soak into ground, commonly used in conjunction with septic tanks.
SSSI	Sites of Specific Scientific Interest. The best examples of the national heritage of wildlife habitats, geological features and landforms, designated by English Nature and the Countryside Council for Wales. Statutory; notified under the Wildlife and Countryside Act 1981.
Surface Water	Water which flows or is stored on the ground surface.
Sustainable Development	Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.
STW	Sewage Treatment Works.
Telemetry	River levels, rainfall, temperatures and wind run are recorded on data loggers connected to the telephone network. These telemetry outstations can be automatically downloaded by forecasting and data archive systems to provide real-time and historical information.
Trade Effluent	Effluent derived from a commercial process/premises.
Transfer Station	Waste disposal facility where waste is collected prior to transport to final disposal point.
Underground Strata	A term used to signify geology under the surface soil layer. If groundwater exists, or if water is being discharged to the ground, the geology underneath the soil layer is known in the various Acts of Parliament as 'underground strata'.
UWWTD	Urban Wastewater Treatment Directive.
Water Quality Objective (WQO)	The level of water quality that a river should achieve in order to be suitable for its agreed uses.
Water Table	Top surface of the saturated zone within the aquifer.
Wetland	An area of low lying land where the water table is at or near the surface for most of the time, leading to characteristic habitats.
WO	Welsh Office.