RIVER STOUR
CATCHMENT MANAGEMENT PLAN

Consultation Document

NRA

National Rivers Authority
Severn-Trent Region

NRA

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Severn-Trent Region

River Stour Catchment Management Plan
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December 1992

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 Document is the first stage in the catchment management planning process for the River Stour sub-catchment. It provides a vehicle for consultation and also a means of seeking commitment from those involved to seek to realise the full environmental potential of the catchment.

We look forward to receiving 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.

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River Stour Catchment Management Plan

1 Catchment Management - Introduction

The National Rivers Authority is the major environmental agency responsible for safeguarding and improving the natural water environment of England and Wales. Its responsibilities are wide reaching and 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.
- Promoting the conservation of the natural water environment.
- Promotion of water-based recreation.

A river catchment is a discrete geographical area which is drained by a single surface water system. The 21 600 km^2 covered by the Severn-Trent Region of the NRA consists, in principle, of only two catchments - that of the River Severn and River Trent. Because of their large surface area, they have been divided, for management purposes, into sub-catchments.

Catchment management assists the NRA in using its statutory powers, and through working with others, to ensure that rivers, lakes, coastal and underground waters are protected and, where possible, improved for the benefit of future generations. Catchment Management Planning is the process by which the NRA co-ordinates all its activities within and between individual catchments.

To achieve this success, the NRA works with Local Authorities, industry, farming and the general public to promote environmental awareness and to enforce appropriate environmental standards. This **draft** Catchment Management Plan forms the basis for consultation on the future of the natural water environment of the River Stour sub-catchment.

The document consolidates the policies, objectives and options for the integrated management of the River Stour catchment, and is drawn up as follows -

1. **Catchment Overview.** This gives a brief description of the catchment geography.
2. **Catchment Uses.** For each of the existing and potential water-related uses a general statement describes the nature of the activity. This is followed by a summary of the local perspectives. One or more objectives for the maintenance and enhancement of the use are proposed, and the requirements on the riverine environment to meet these objectives are listed where applicable.
3. **Catchment Targets and Current Status.** From the objectives identified for individual uses, overall targets are summarised with respect to Water Quality, Water Quantity and River Engineering. In each case these are compared with the current

status of the catchment, so that shortfalls and conflicts of interest can be identified.

4. **Management Options.** The final section comprises a set of tables listing the options proposed by the NRA for the satisfactory resolution of each issue.

This document is now released for public consultation, before the final Action Plan is produced. Comments are invited on the content of the plan and on the issues and management options which have been identified. These should be sent to :-

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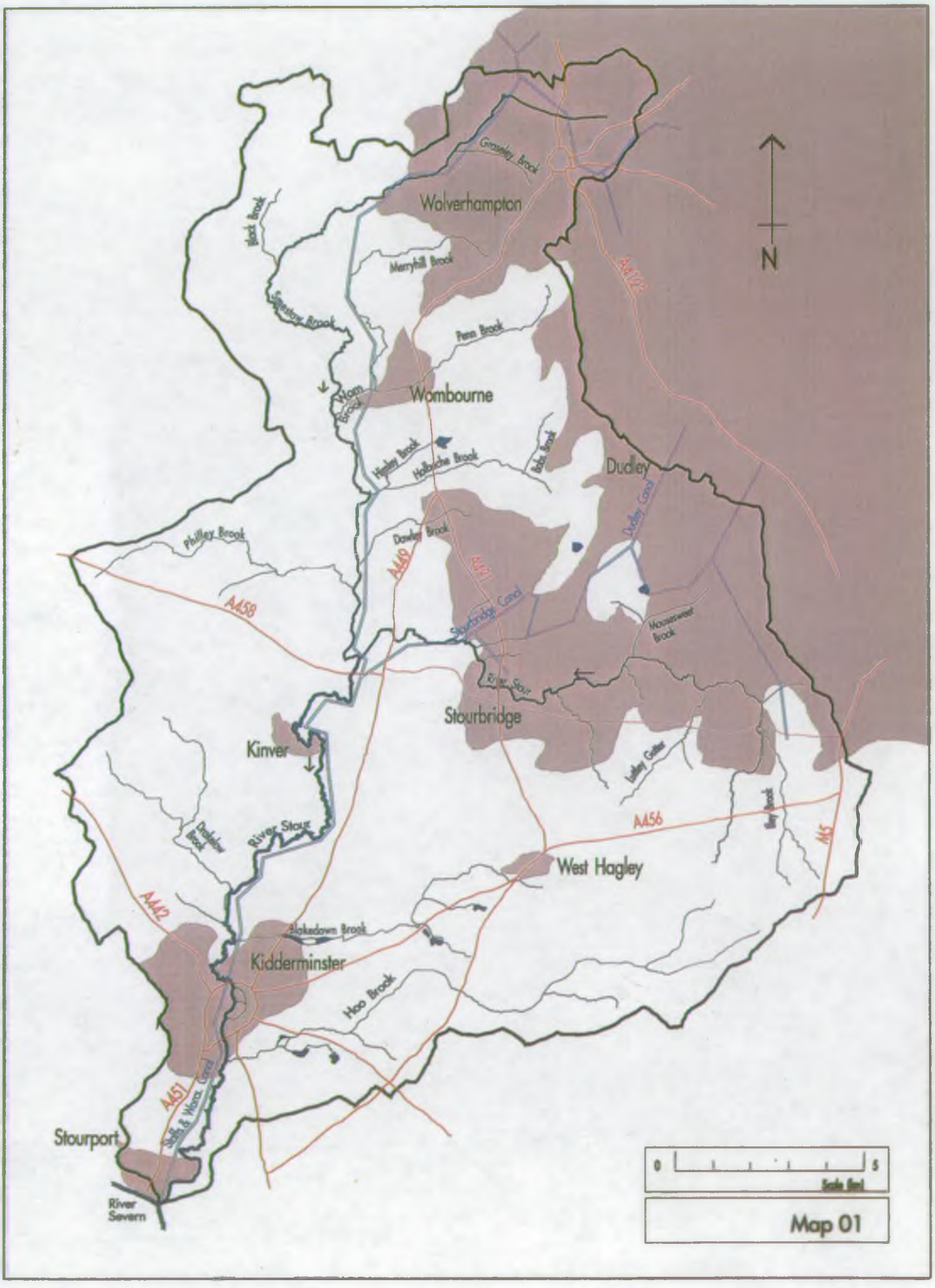
All contributions should be made before 26 February 1993.


Wolverhampton
Wombourne
Dudley
Stourbridge
Kinver
West Hagley
Kidderminster
Stourport
River Severn
Grosvely Brook
Merrybill Brook
Penn Brook
Warn Brook
Himley Brook
Holbache Brook
Tobbs Brook
Dudley Canal
Dowker Brook
Stourbridge Canal
Housesower Brook
River Stour
Valley Gutter
Bury Brook
Phillley Brook
Dodder Brook
Blakedown Brook
Hoo Brook
Staffs & Worcs Canal
A4123
A459
A491
A458
A456
M5
A442
A451
N
0
5
Scale 5km
Map 01

2 Catchment Overview

2.1 Surface water system

The River Stour drains a surface area of 373 km² within Hereford and Worcester, Staffordshire and the West Midlands. The River Stour and its principal tributary, the Smestow Brook, rise in the Clent Hills and Wolverhampton respectively. They flow west and south through the heavily urbanised environment of the West Midlands conurbation, to their confluence at Stourton. The River Stour continues south through the town of Kidderminster, and flows into the River Severn, at Stourport.

A section of the Staffordshire & Worcester Canal follows close by the course of the Smestow Brook, and then the River Stour. This provides a link between the Shropshire Union Canal and Birmingham Canal networks and the River Severn. A branch of the canal splits close to the Smestow Brook/Stour confluence and follows the course of the Stour east into the conurbation. Here it subsequently divides into the two parallel arms of the Dudley Canal.

The locations of the various watercourses are shown on the map opposite. Table 1, overleaf, lists the total length of each watercourse, the length classified for water quality objectives and the length (for rivers only) which is maintained by the NRA for flood protection purposes (Main River).

See Section 4.1.1
See Section 3.6.1

2.2 Current land use

The two dominant land uses in the catchment are agriculture and urbanised development, both of which have a significant impact on the aquatic environment.

To the north and east, the catchment overlaps the West Midlands conurbation. The Metropolitan Boroughs of Wolverhampton, Dudley and Sandwell cover 35% of the catchment area. Historically, the Black Country has been a significant industrial and residential centre, and still supports important light engineering/manufacturing industry. In recent years, high technology business parks have been established in and around the urban centres.

In the lower reaches of the River Stour, the town of Kidderminster supports a number of large carpet factories, a sugar-beet processing plant and other light industrial works.

The rest of the catchment is dominated by intensive arable agriculture, with small localised areas of pasture, particularly on the urban/sub-urban fringes.

Map 1	Surface water system and general features		
River		Urban area	
Canal			
Catchment boundary		Road	

Watercourse	Total length (km)	Length classified for River Quality Objectives (km)	Length of Main River maintained by the NRA for flood protection (km)
Rivers -			
River Stour	62.3	46.8	46.3
Illey Brook	12.0	3.5	0.0
Lutley Gutter	7.0	2.5	0.0
Mousesweet Brook	5.0	3.0	3.0
Smestow Brook	40.3	19.5	25.3
Black Brook	4.0	0.0	1.0
Wom/Penn Brook	7.6	5.6	3.0
Merryhill Brook	7.0	5.8	0.0
Holbeche Brook	6.1	3.3	0.0
Bobs Brook	2.9	2.5	0.0
Drakelow Brook	16.0	4.0	0.0
Blakedown Brook	16.1	5.0	0.0
Hoo Brook	28.0	10.3	2.3
Sub-total	**214.3**	**111.8**	**80.9**
Canals -			
Staffs & Worcester	39.2	39.2	
Stourbridge	5.5	5.5	
Dudley	19.0	19.0	
Birmingham & Wolverhampton	4.0	4.0	
Sub-total	**67.7**	**67.7**	

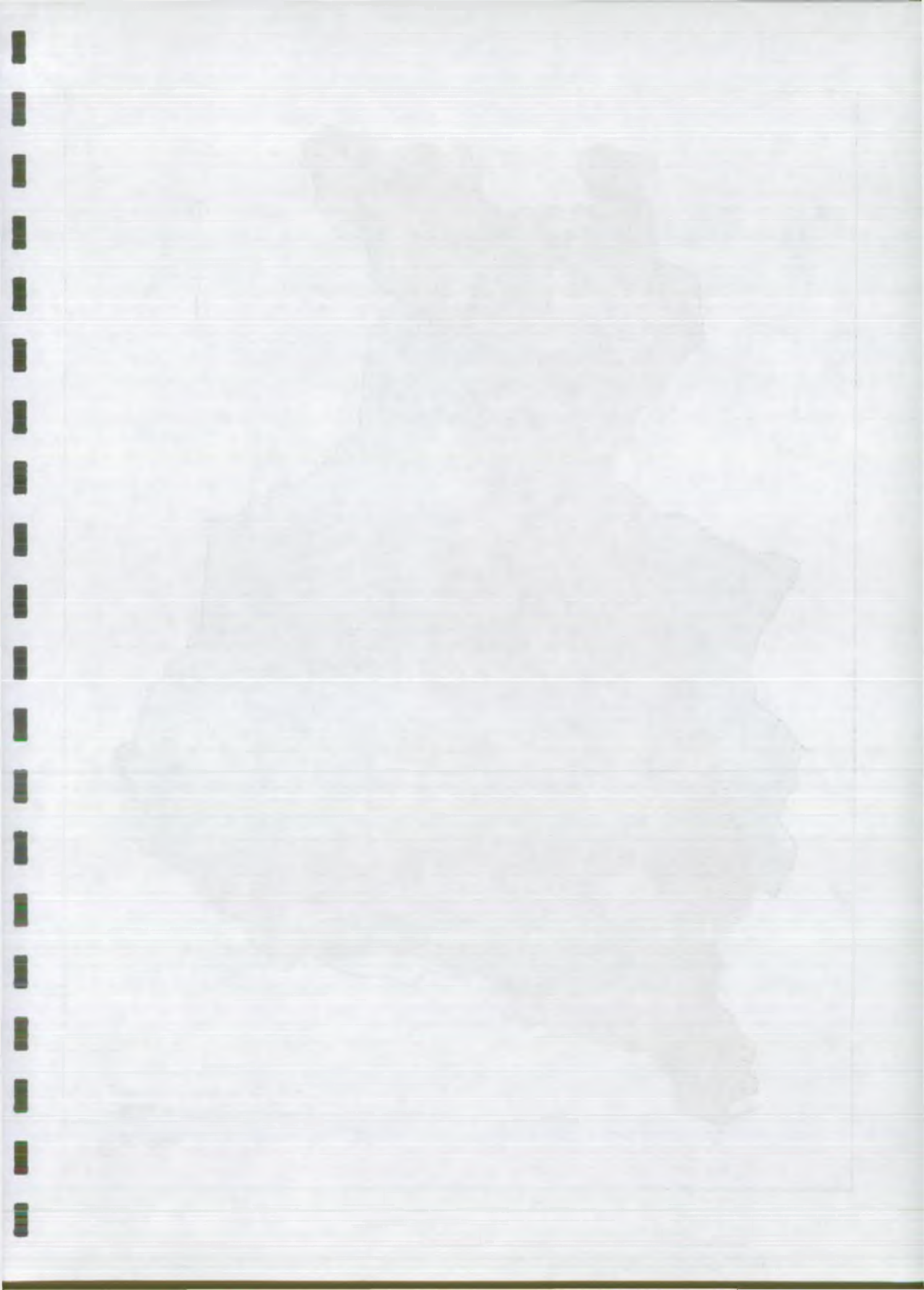
Table 1. Lengths (km) of the various watercourses in the Stour Catchment - total length, length classified for River Quality Objectives and length maintained for flood defence purposes (Main River).

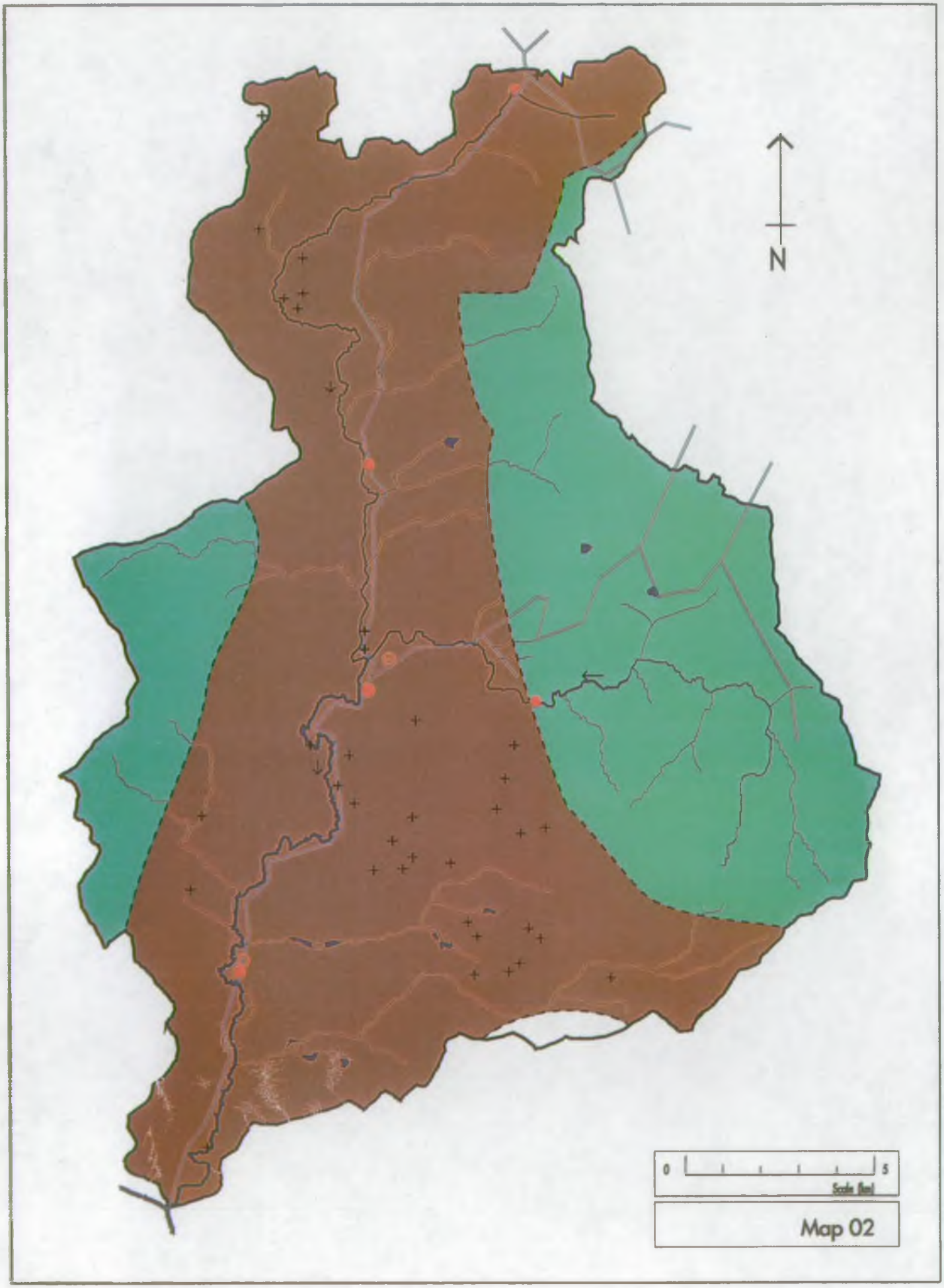
The area is served by an extensive road network and several railway lines link the Black Country and Kidderminster with the centre of the conurbation.

The catchment covers an area overlapping four counties and seven districts/boroughs. The importance of Local Authorities is discussed in detail in **Section 3.1 - Urban Development.**

2.3 Hydrology and Hydrogeology

Rainfall in the Stour catchment is lower that the average for the region, with an average annual rainfall of around 700mm. Evaporation accounts for 460mm, leaving about 240mm to run-off into rivers and percolate through to groundwater.




N
0
5
Scale Bar
Map 02

Five gauging stations, mainly linked by telemetry, currently operate within the catchment and provide continuous flow data (see Map 2). Representative flows in the two principal watercourses are summarised in Table 2.

	Flow under dry weather conditions (Ml/d)	Average Daily Flow (Ml/d)
Smestow Brook - Swindon	23.4	46.2
River Stour - Kidderminster	135.0	245.6

Table 2. Representative dry weather flows and average daily flows (Megalitres/ day) for the River Stour and Smestow Brook.

As will be discussed later in this document, there is a large artificial component to the river flow in the main watercourses, comprising **treated** sewage and industrial effluents.

The central section of the catchment is occupied by the Sherwood Sandstone aquifer, which dip gently to the east where they are faulted against Carboniferous rocks; in the extreme south east they are overlain by Mercia Mudstones. To the west the sandstones are again faulted against a combination of Carboniferous and Devonian strata. There are small areas of Boulder Clay in the northern part of the catchment. In addition, alluvium is found in the valleys of the Stour and Smestow Brook. The extent of these strata is shown on Map 2.

The sandstones are highly permeable and have been extensively developed for public water supply and, to a lesser extent, for industrial and agricultural abstraction. In contrast, very little groundwater development has taken place in the western and eastern sectors of the catchment, ie areas dominated by the less permeable Carboniferous and Devonian strata.

Groundwater levels are largely determined by topography, but are also influenced locally by high abstraction. The average depth to the ground water level varies between 5 and 20 metres, but reaches a maximum of 70 metres on the higher ground in the Stourbridge area.

Map 2 Catchment hydrology and hydrogeology

River
Canal
Catchment boundary
Urban area
Road

Major aquifer (Sherwood Sandstone)
Minor aquifer (Coal Measures)
Non-aquifer area
Observation borehole
Major gauging station
Minor gauging station

3 Catchment Uses

This section identifies those activities which impact upon, or are influenced by, the water environment within the Stour catchment.

For each catchment use identified, the information is discussed in the following format:-

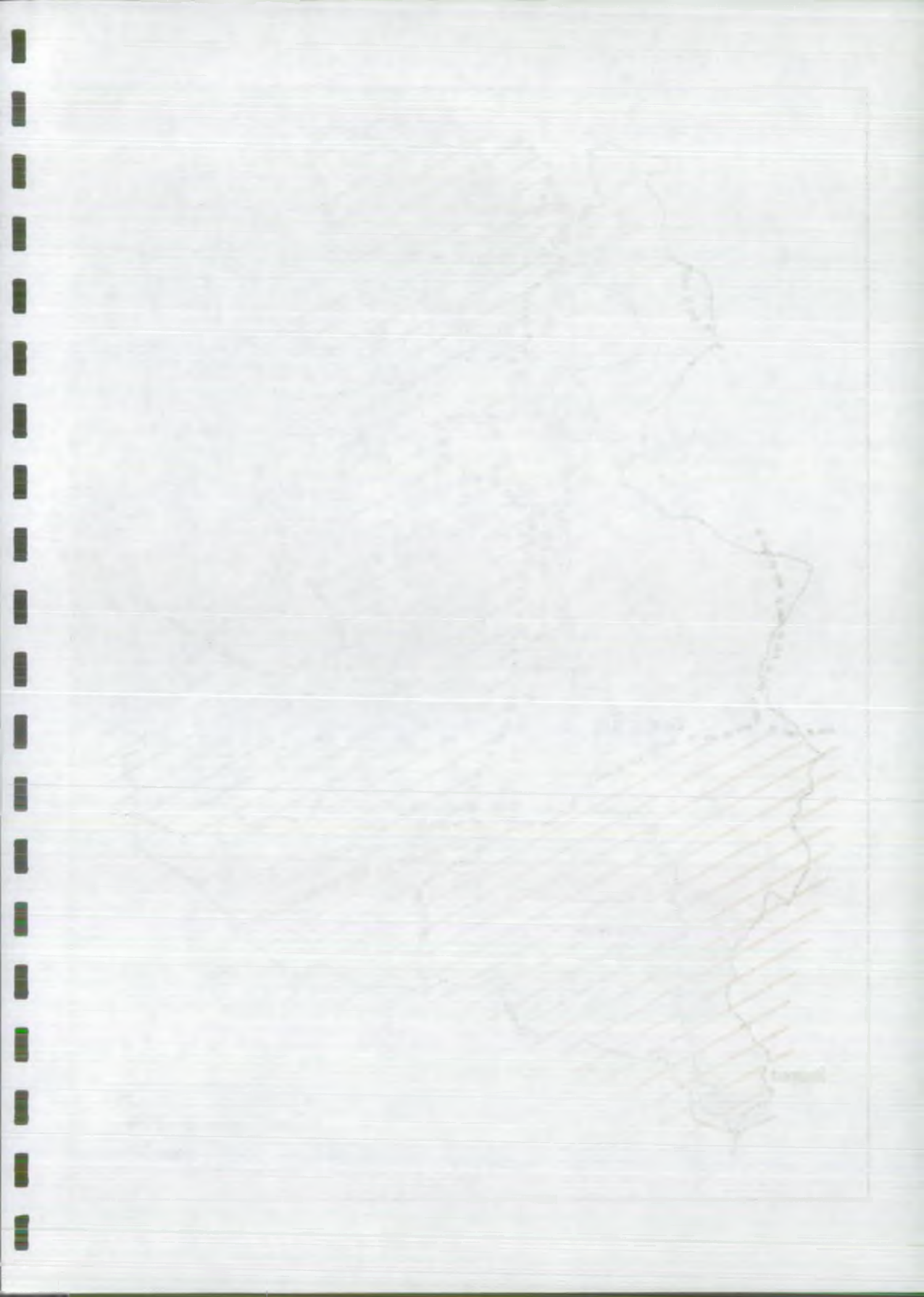
General - this defines the use and describes any general characteristics it may have.

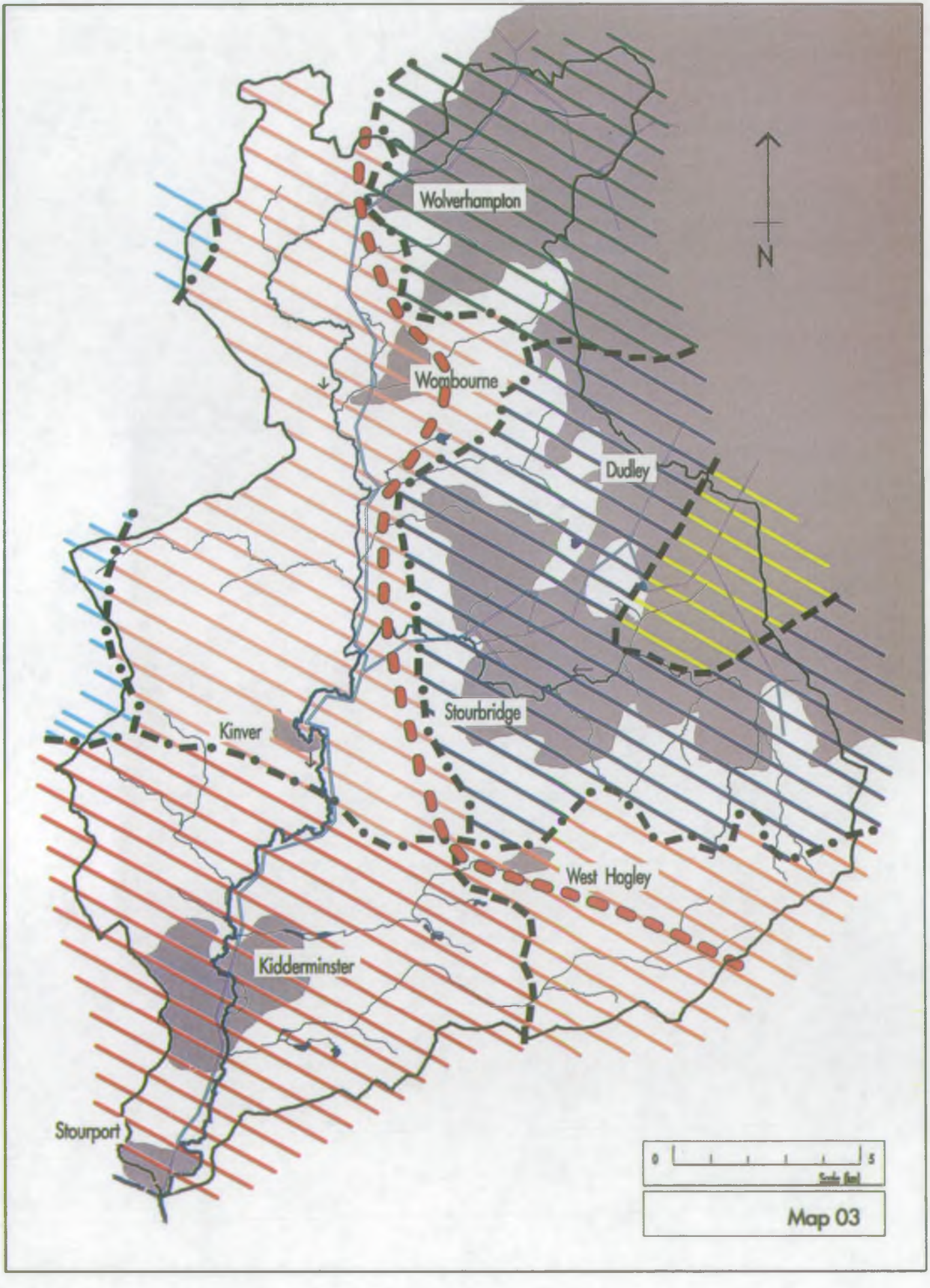
Local perspectives - this describes the extent of the use within the River Stour catchment.

Objectives - this identifies the NRA's perceived development of the use.

Requirements - where appropriate, the environmental requirements to achieve the above objectives are stated. These requirements, if available, are listed for each of the following criteria -

i) Water Quality
ii) Water Quantity
iii) River Engineering




Wolverhampton
N
Wombourne
Dudley
Stourbridge
Kinver
West Hagley
Kidderminster
Stourport
0
5
Map 03

3.1 Urban development

3.1.1 General

Development for industrial, residential and commercial purposes is a fundamental consideration when planning for the enhancement of a river catchment. Although land use planning matters are the responsibility of the County, District or Metropolitan Authorities, the NRA is a statutory consultee in the planning process. As such it has a key role in influencing proposals which may have an impact on NRA matters.

The NRA Severn-Trent Region has produced the following model policies which it seeks to have included in revisions of Local Authority Development Plans:-

Policy 1 - Flood Defence.
Policy 2 - Registered Contaminated Land.
Policy 3 - Groundwater Protection
Policy 4 - Water Pollution Prevention
Policy 5 - Water Environment
Policy 6 - Water Resources

These policies are detailed in Appendix 1.

3.1.2 Local perspectives

Much of the River Stour catchment has been heavily urbanised, with development centred on the industrial Black Country boroughs of Wolverhampton, Sandwell and Dudley. The upper reaches of the principal watercourses pass through these areas, and previous urbanisation has led to the current pressures on virtually the whole aquatic environment.

The town of Kidderminster has also experienced development with the growth of the carpet industry, and is the source of further impacts on the lower reaches of the River Stour.

Map 3	Local Authorities and urban development		
River		Urban area	
Canal			
Catchment boundary		Road	
Wolverhampton MBC		Bromsgrove DC	
Dudley MBC		Wyre Forest DC	
Sandwell MBC		Bridgnorth	
South Staffordshire DC		Proposed Western Orbital Route	

The following table lists the Local Planning Authorities concerned with the Stour catchment, along with the Development Plans which have been consulted in order establish the extent of proposed development -

Local Authority	Area (km^2)		Development Plan
Wolverhampton	29.8		Wolverhampton Unitary Development Plan - Draft Statement (Feb.1990)
Dudley	89.4		Dudley Unitary Development Plan - Written Statement (Aug.1991)
Sandwell	10.3		Sandwell Unitary Development Plan - Draft Statement (Mar.1991)
West Midlands	**129.5**	**(35%)**	Strategic Guidance for the West Midlands (PPG10, 1988)
South Staffordshire	114.7		South Staffordshire Local Plan - Draft Statement (Sept.1991)
Staffordshire	**114.7**	**(31%)**	Staffordshire County Council - Structure Plan (Apr.1991)
Wyre Forest	81.8		Wyre Forest Urban Areas Plan - Written Statement (Apr.1989) Kidderminster Town Centre Local Plan - Written Statement (Aug.1984)
Bromsgrove	40.3		Bromsgrove District Council Local Plan - Draft Statement (Nov.1991)
Hereford and Worcester	**122.1**	**(33%)**	Hereford and Worcester County Structure Plan - Written Statement (Jul.1990)
Shropshire Bridgnorth)	**3.7**	**(<1%)**	

The County of Hereford and Worcester Draft Minerals Local Plan (Sept.1991), and the Staffordshire County Council Aggregates Local Plan 1989-2001 - Written Plan (Dec.1991) have also been consulted. Existing and proposed mineral extractions are discussed under **3.7 Mineral Extraction**.

Future development in the West Midlands MBCs (Wolverhampton, Sandwell and Dudley) will concentrate on the regeneration of those inner city areas where results are most likely to be achieved. However, there is also a requirement for the provision of high technology sites on the periphery of the conurbation, which are to be identified and developed in line with demand.

In addition to new dwellings within the Metropolitan Districts, housing is also proposed for the surrounding Shire Counties. The Districts of South Staffordshire, Wyre Forest

and Bromsgrove have allocated land for development in their respective Local Plans, which also identify sites for possible industrial/commercial development.

Local Authority		Housing requirement (period)	
West Midlands -	Dudley	7400	(1988-2001)
	Sandwell	7500	" "
	Wolverhampton	4500	" "
Sub-total		19400	
Hereford & Worcester -	Wyre Forest	5200	(1986-2001)
Bromsgrove		6200	" "
Sub-total		11400	
Staffordshire -	South Staffordshire	919	(1991-2001)

Table 3. Housing requirements as identified in Local Development Plans.

NB. The above figures represent the likely levels of housing increases for each District/Borough. The Stour catchment will absorb only a proportion of this housing.

The preferred course of the Western Orbital Route, linking the M5 and M54, runs along a corridor to the west of the conurbation (see Map 3). This will improve access to potential growth areas and have a significant influence on the degree of future development.

Virtually all of the non-urban area to the west of the conurbation is designated Green Belt. The relevant Development Plans identify the constraints imposed by Green Belt and Strategic Gap policies, and recognise that future development should not detract from the landscape and ecological value of the area.

3.1.3 Objectives

* To seek the adoption of NRA model policies in Local Development Plans.

* For the NRA to use its status as a statutory consultee, to influence any future development that will, in its opinion, compromise the activities of the other catchment users.

* To encourage environmental enhancement as part of urban development/re-development.

Objectives relating to specific aspects of development, for example, water supply, effluent disposal and surface water drainage, are identified in subsequent sections.

Black Brook
Merryhill Brook
Penn Brook
Wom Brook
Hinksford Brook
Holbeche Brook
Bobs Brook
Dudley Canal
Dawley Brook
Philley Brook
Stourbridge Canal
Mousesweet Brook
River Stour
Lutley Gutter
Illey Brook
Drakelow Brook
River Stour
Blakedown Brook
Hoo Brook
Staffs & Worcs Canal
River Severn
N
0
5
Scale (km)

Map 04

3.2 Ground and Surface Water Abstraction

3.2.1 General

This use relates to the supply of water from ground and surface sources for public supply (potable) and for industrial and agricultural (non-potable) use. Groundwater abstraction constitutes supply from wells and boreholes constructed into underground permeable rocks, termed aquifers; surface water abstraction is direct from rivers, canals, lakes and reservoirs.

Abstraction, other than for private, domestic use (<20m^3 per day), is controlled by licence, under the Water Resources Act, 1963, which stipulates the maximum daily and annual quantity allowable. Ground and surface water sources developed prior to the introduction of this act were granted Licences of Right. Since 1963, licences have been granted on the basis that new abstraction does not cause derogation of existing uses of ground and surface water. Licences may include control levels to protect resources from over-commitment.

Public water supply accounts for the largest proportion of abstracted water in the River Stour catchment (90% by volume), followed by that for industrial use (8%) and agricultural abstraction accounting for the remainder (2%). Whereas only three public water supply companies operate in the catchment, abstraction for industrial and agricultural use is undertaken by numerous individual abstractors. Table 5 gives a summary of the licences and abstractions for the different categories.

Map 4	Groundwater abstraction		
River		Urban area	
Canal			
Catchment boundary		Road	
Abstraction boreholes			
Public water	< 10Ml/d	Public supply	> 10Ml/d
Industrial use	< 1Ml/d	Industrial use	> 1Ml/d
Agricultural use	< 1Ml/d	Agricultural use	> 1Ml/d

Type of abstraction	Number of licences	Licensed abstractions (Ml/d)	Percent (by volume)
Public consumption	22	189.88	90%
Industrial	49	17.64	8%
Agricultural	87	4.68	2%

Table 4 - Summary of licences and abstractions from ground and surface water sources (Ml/d = Megalitres/day).

Although industrial and agricultural abstraction only accounts for a small proportion of the total volume, it can have a considerable impact on water resources. The water can be used for system cooling or spray irrigation; as such, a large proportion is removed from the catchment through evaporation. The problem is compounded by the fact that abstractions for spray irrigation are necessary during the summer, at a time of low rainfall and low river flows. To minimise the impact on water resources and protect existing rights, a system operates to restrict spray irrigation activity; when river flows fall below a certain threshold, specified irrigations must cease.

See Section 4.2.2

The management of water resources is dependent on the nature of the resource. It follows that abstraction should be considered in terms of ground and surface water sources.

3.2.2 Local perspectives - Groundwater sources

The Stour Catchment covers two aquifer types -

a) Sherwood Sandstone.

Resources in the Sherwood Sandstones have been extensively developed by the public supply companies which operate in the catchment. A summary of their licences and abstractions is shown in Table 5.

Company	Number of sources	Licensed abstraction (1992) (Ml/d)	Actual abstraction (1991)
South Staffs Water	7	89.54	84.29
Severn Trent Water	12	88.98	61.42
East Worcester Water	1	11.36	11.91

Table 5. Summary of licences held and actual abstraction for public water supply.


N
Grazeley Brook
Black Brook
Merry Hill Brook
Smestow Brook
Penn Brook
Warm Brook
Hinkley Brook
Holbeache Brook
Bobs Brook
Dudley Canal
Dowley Brook
Phillips Brook
Stourbridge Canal
Mousesweet Brook
River Stour
Lutley Gutter
Bay Brook
Dunsley Brook
River Stour
Blakedown Brook
Hoo Brook
Staffs & Worcs Canal
River Severn
0
5
Scale (km)
Map 05

In addition, Severn Trent Water holds licences covering two sources amounting to 17.76 Ml/d. These licences permit emergency usage in severe drought conditions: one of the licences also allows artificial recharge of the aquifer.

Potable water abstraction is evenly distributed over the aquifer area, with many of the sources located in the valleys of the Smestow Brook and the River Stour.

A total of 34 abstraction licences are in operation for industrial use, permitting an abstraction of 14.53 Ml/d (1992); the actual abstraction rate is 7.16 Ml/d (1991).

As would be expected, virtually all the abstractions are centred on Stourport, Kidderminster, Stourbridge and Wombourne. In contrast to public water supply, actual abstraction for industrial purposes only accounts for 50% of licensed abstraction. Whilst this low rate may be reflective on the current reduced rate of industrial activity, it is also influenced by the decline in heavy water-using industries, specifically the carpet industry. It was also common practice for industries to apply to abstract larger volumes than initially anticipated. This avoided delay in applying for a variation to the licence when increased abstraction was subsequently required.

A total of 41 licences permit the abstraction of 2.78 Ml/d (1992) for agricultural use: the actual abstraction rate is 1.39 Ml/d (1991), and is evenly spread across the catchment.

b) Carboniferous/Devonian strata

Due to the impermeable nature of the underlying rock, very few individual boreholes exist in the area covered by Carboniferous/ Devonian strata. There are no public water supply abstractions, and only two licensed abstractions, totalling less than 0.01 Ml/d, are in operation for industrial supply.

A total of 9 licences are in operation for agricultural use, permitting abstraction of 1.14 Ml/d, with actual abstraction amounting to 0.70 Ml/d.

Map 5	Surface water abstraction		
River		Urban area	
Canal			
Catchment boundary		Road	
Public water	< 10Ml/d	Public supply	> 10Ml/d
Industrial use	< 1Ml/d	Industrial use	> 1Ml/d
Agricultural use	< 1Ml/d	Agricultural use	> 1Ml/d

Only a limited number of licence applications are anticipated in the future; any which are received will be subject to very critical consideration as any significant abstraction may reduce baseflow to the tributaries of the River Stour.

See Section 4.2.2

The location of abstractions for potable and non-potable supply from groundwater sources can be seen on Map 4.

3.2.3 Local perspectives - Surface water sources

The three water supply companies do not operate surface water abstractions within the catchment to service public supply, and there are also few abstractions for industrial use. Of the latter, those which do occur include abstractions for industrial process, amenity pools and some cooling.

The majority of abstraction from the surface water system is for spray irrigation. There is a large number of relatively small abstractions (47 licences), particularly in the southern part of the catchment. These are concentrated around the River Stour/Smestow Brook confluence and along the Hoo Brook.

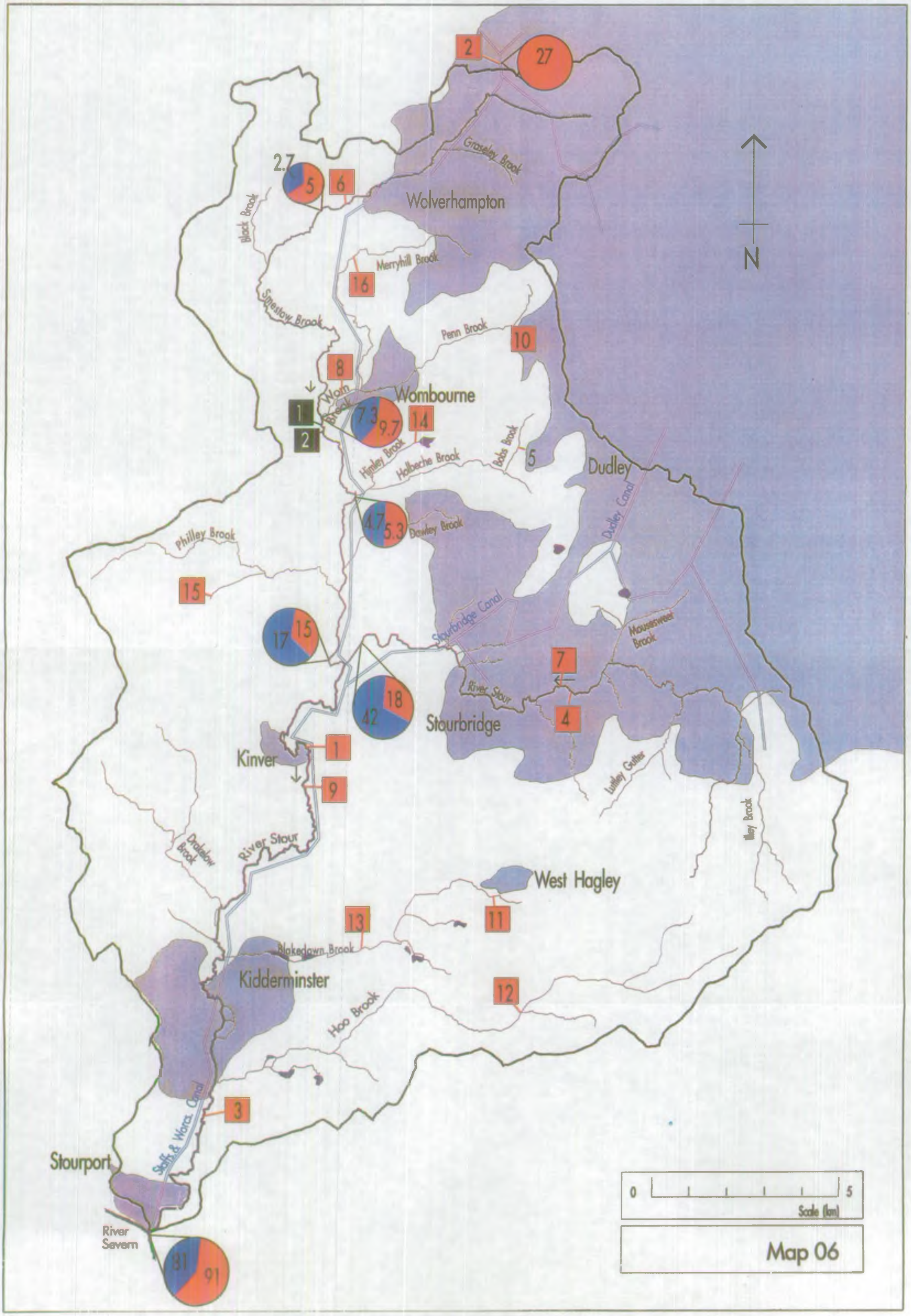
The location of abstractions for potable and non-potable supply from surface water sources can be seen on Map 5.

3.2.4 Objectives

The following objectives have been set for ground and surface water abstraction, with regard to the water resource characteristics of the River Stour catchment.

See Section 4.1-2

* To manage abstraction to long-term sustainable levels.
* To encourage efficient water use and to optimise re-use.
* To optimise conjunctive use appropriate to local conditions and seasonal considerations.
* To encourage abstraction in winter for storage for summer use.
* To safeguard potable abstraction sources with respect to water quality and quantity.
* To ensure the protection of groundwater through the Groundwater Protection Policy, land use planning and other appropriate means.


2
27
2.7
5
6
Wolverhampton
Graseley Brook
Black Brook
Merryhill Brook
16
Smestow Brook
Penn Brook
10
8
Worn Brook
Wombourne
1
2
7.3
9.7
14
Hinkley Brook
Halberche Brook
Bobs Brook
5
Dudley
Dudley Canal
4.7
5.3
Dawley Brook
Philley Brook
15
17
15
Stourbridge Canal
Mousesweet Brook
7
River Stour
18
42
Stourbridge
4
Kinver
1
9
Lutley Gutter
Hay Brook
Dratelow Brook
River Stour
West Hagley
13
11
Blakedown Brook
Kidderminster
12
Hoo Brook
3
Stourport
Staffs & Worcs Canal
River Severn
81
91
N
0
5
Scale (km)
Map 06

3.3 Effluent Disposal

3.3.1 General

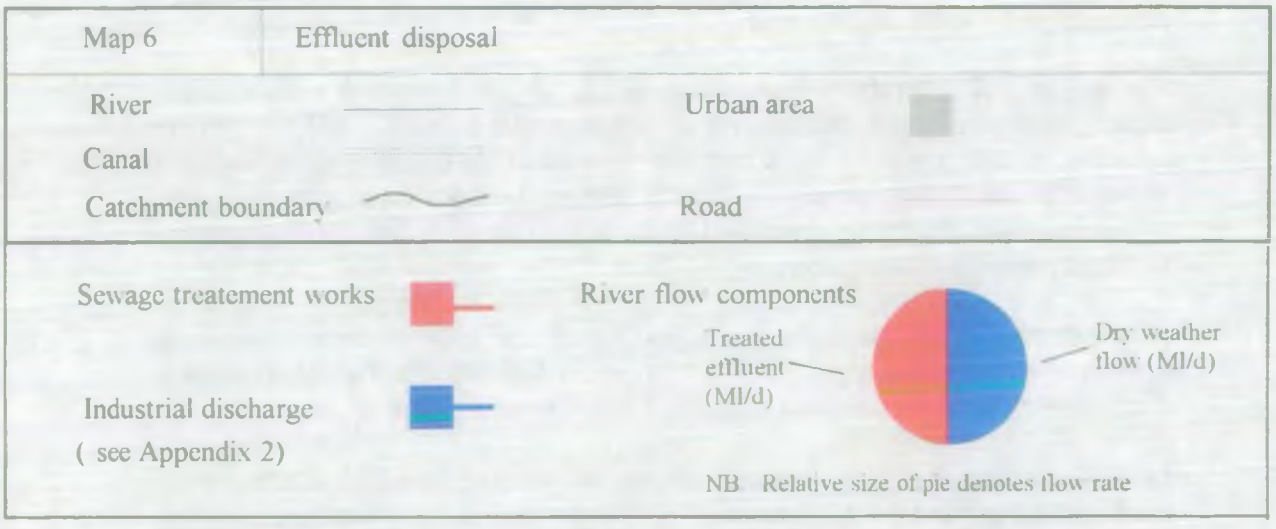
This use relates to the disposal of domestic and industrial effluents to the river system. The Authority controls the quantity and quality of discharges by way of issuing discharge consents, under Schedule 10 of the Water Resources Act, 1991. The conditions set out in this consent document are calculated taking into account the water quality and flow rate in the receiving water course and the uses of the river downstream. It follows that if there is any subsequent deterioration in upstream water quality or reduction in river flow below the values used in calculating the discharge consent, then the downstream uses would be put at risk.

3.3.2 Local perspectives

In July 1992 there was a total of 367 consented effluent discharges in the Stour catchment; the number in each respective category of discharge are shown in Table 6.

Type of Discharge	Number
Severn Trent Water STPs	18
Storm Tank Discharges	13
Sewer Overflow	128
Emergency Sewage Discharges	19
Private STPs	53
Industrial Discharges	47
Surface Water Sewers	15
Discharges to Underground Strata	74

Table 6. Consented Discharges in the Catchment, July 1992 (STP = Sewage Treatment Plant).



Seventy five percent of these discharges arise from Severn Trent Water Ltd.'s sewage collection and treatment operations. This group of discharges has a major impact on both the quality and the quantity of surface water in the catchment. Under dry weather conditions over half the flow of the River Stour, at Stourport, comprises treated sewage effluent.

Severn Trent Water Ltd. is responsible for treating most of the sewage produced in the catchment at 18 Sewage Treatment Works (STWs). Of these, four are responsible for treating 80% of the total volume (Roundhill, Barnhurst, Freehold, and Kidderminster). These STW's also discharge effluent originating from outside of the catchment. The locations of the 18 STWs are shown in Map 6, along with the proportion of effluent in various water courses, relative to natural flow under dry weather conditions.

During periods of wet weather, the river system can also receive 13 discharges of partially treated sewage from storm tanks, and 128 discharges of untreated sewage from sewer overflows. These discharges are allowed, so as to prevent the foul flooding of property when the sewers become overloaded, due to storm water and the gross overloading of sewage works. If the sewerage system is correctly designed and constructed, then overflows should only occur when sewage is likely to be diluted, both by storm water in the sewer and by high river flows on discharge. Under these circumstances the impact of the discharges on the receiving water should be minimal, and should not affect any of its legitimate uses.

See Section 4.1.2

In addition to the discharges of treated sewage effluent from Severn Trent Water's STWs, there are 53 similar discharges from privately owned STWs. These serve either a single, or small groups of properties. Such discharges are only permitted where mains drainage is not available, ground conditions do not permit septic tank drainage and where a suitablewatercourse is available to receive the effluent.

There are 47 consented industrial discharges in the catchment. The two most important originate from Everest Frozen Foods, which discharges potato-processing effluent from a modern treatment facility, and Russell Hobbs Tower, which discharges treated metal finishing waste (see Map 6). Other industrial discharges in the catchment include site drainage from quarries and waste disposal sites, cooling water from manufacturing processes and swimming pool water.

The majority of industrial effluents produced in the catchment are not discharged directly to the river system, but to foul sewers and treated at Severn Trent Water's STWs. Because the ability of the sewage treatment process to treat some types of industrial effluents is limited, the amounts and types of industrial effluents which are discharged to the sewer must be closely controlled by the Water Company if the sewage works is to comply with its discharge consent conditions.

Although there are 239 consented discharges in the catchment, there are many times that number of existing discharges which do not require consents. Most of these consist of discharges of surface water from both urban and agricultural land.

Individually, very few of the surface water discharges have a significant effect on the quality of the receiving water courses. However, the total surface water drainage from urban areas is thought to contribute a significant quantity of suspended solids and toxic

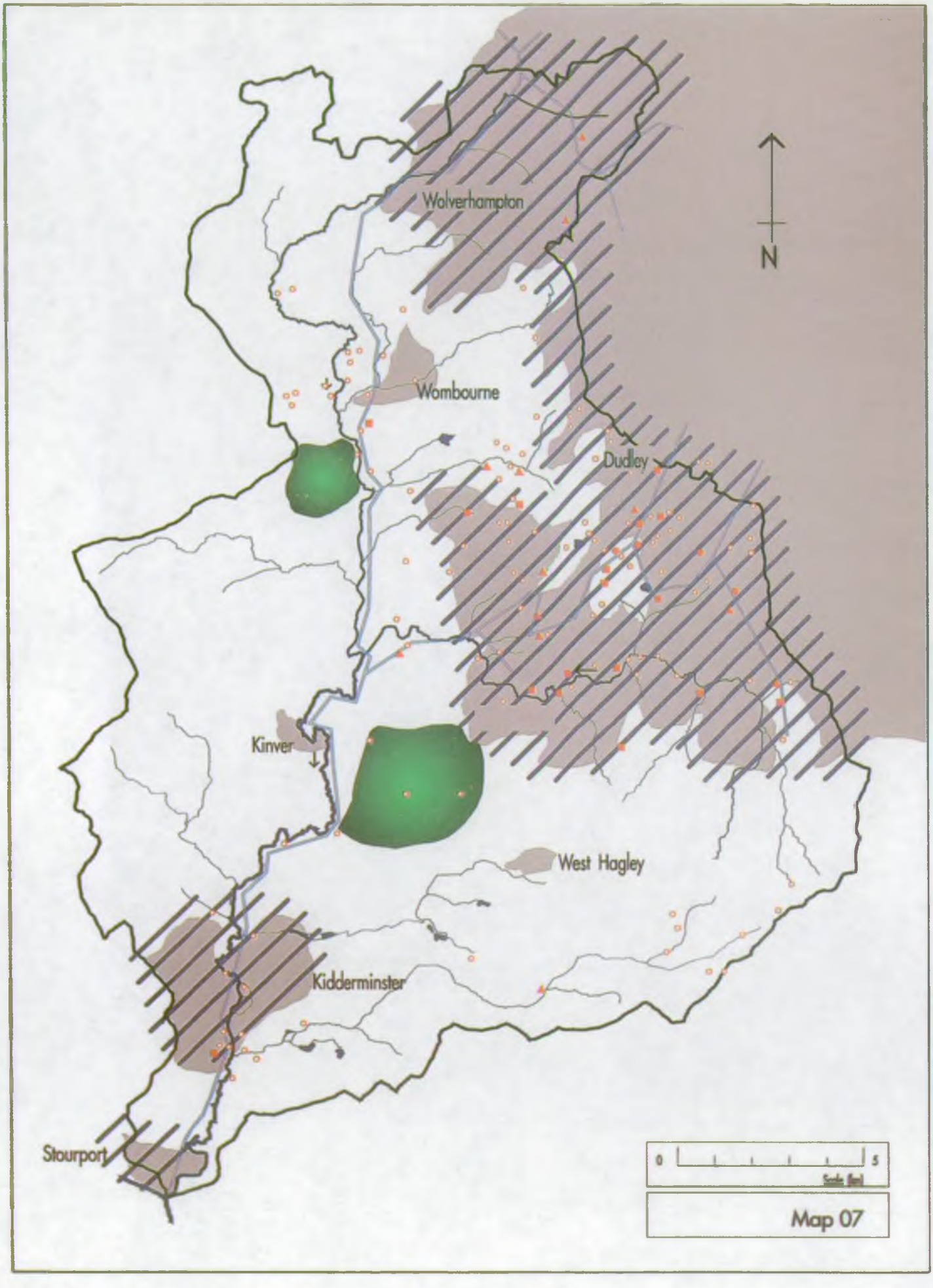
metals to the river system. The surface water drainage from agricultural land can add organic pollutants together with nitrates and phosphates to the aquatic environment.

3.3.3 Objectives

* To allow the disposal of effluent without compromising other catchment users.

3.3.4 Requirements

Water Quality	- no deterioration in upstream water quality beyond that assumed in setting a consent for an authorised discharge.	*See Section 4.1 & Issue B.1-9*
Water Quantity	- no reduction in river flow upstream of a discharge. This requirement severely restricts the number and type of licence which can be granted in this catchment.	*See Section 4.1-2 & Issue D.1-5*
River Engineering	- no instream changes which increase stream velocity or reduce re-aeration, as this will reduce the self- purification capacity of the watercourse.	*See Section 4.3*


Wolverhampton
N
Wombourne
Dudley
Kinver
West Hagley
Kidderminster
Stourport
0
5
Map 07

3.4 Solid Waste Disposal and Contaminated Land

3.4.1 General

Land can become contaminated with significant levels of metals, nitrates or hydrocarbons, for example, as a result of a number of activities. These pollutants can subsequently impact on surface and groundwater quality, through surface run-off and percolation to an underlying aquifer.

The major impacts on groundwater quality within a catchment, especially if it is heavily urbanised, can be attributed to just three land uses.

3.4.2 Local Perspectives - Waste Disposal

Prior to the mid-1970's waste was tipped without specific control over the types of waste 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 (County or Metropolitan Borough Council), under the Control of Pollution Act 1974, Part 1. Disposal practices have evolved rapidly since licensing was introduced; modern landfills are major civil engineering projects, requiring complete containment of any polluting waste to minimise the impact on the water environment.

Scrap yards and in-house waste storage facilities have only recently come under the control of waste disposal authorities. It is common to have soakaways on such sites with little regard for water protection.

The distribution of currently licensed waste disposal sites across the catchment is shown on Map 7. Many disused and previously unlicensed sites exist, but their locations are not always known. The Waste Regulation Authorities concerned with the Stour catchment are likely to have additional records, which could be made available to the NRA.

Map 7	Solid Waste Disposal and Contaminated Land
River	Urban area
Canal	
Catchment boundary	Road
Land potentially contaminated due to industrial activity	Landfill Site
Land affected by sewage sludge spreading/irrigation	Transfer station
	Incinerator
	Other

3.4.3 Local Perspectives - Sewage Spreading

For many years certain areas of the catchment have been used for intensive sewage irrigation and sludge spreading (see Map 7), by Severn Trent Water and its predecessors.

The groundwater quality has been affected with elevated concentrations of nitrates and chlorides, in particular. Although, this activity is being phased out, it will take a considerable amount of time for the contaminants to be flushed through the system; any improvement in the groundwater quality is unlikely within 20-30 years. Severn Trent Water is phasing out this practice with pressure from the NRA and EC legislation accelerating the process.

Past sewage irrigation also led to elevated groundwater levels, which probably increased the flow in the River Stour. The recent reduction in liquid input to the area has contributed locally to an overall reduction in groundwater levels.

3.4.4 Local Perspectives - Industrial Land Use

Much of the catchment has been industrialised for many years, and previous site management practices have led to the localised accumulation of waste and the soaking away of polluting liquids. In the Black Country, industry was so widespread that few areas can be considered uncontaminated. The extent of potentially contaminated land is shown on Map 7. Many of these sites are located around the upper reaches of the river system, and the pollutants leaching from them will be having a significant effect on ground and surface water quality over much of the catchment. One public supply borehole in Stourbridge has recently been decommissioned due to organic chemical contamination from nearby industry.

The full extent of land contaminated as a result of industrial practices is unknown; many sites are coming to the attention of the NRA due to specific water quality problems and through redevelopment. Planning applications are assessed by the NRA and water protection measures are required on many sites to ensure minimal problems in the future. Unfortunately, redevelopment is not planned for every site, or may have occurred, but without the necessary protective measures being taken.

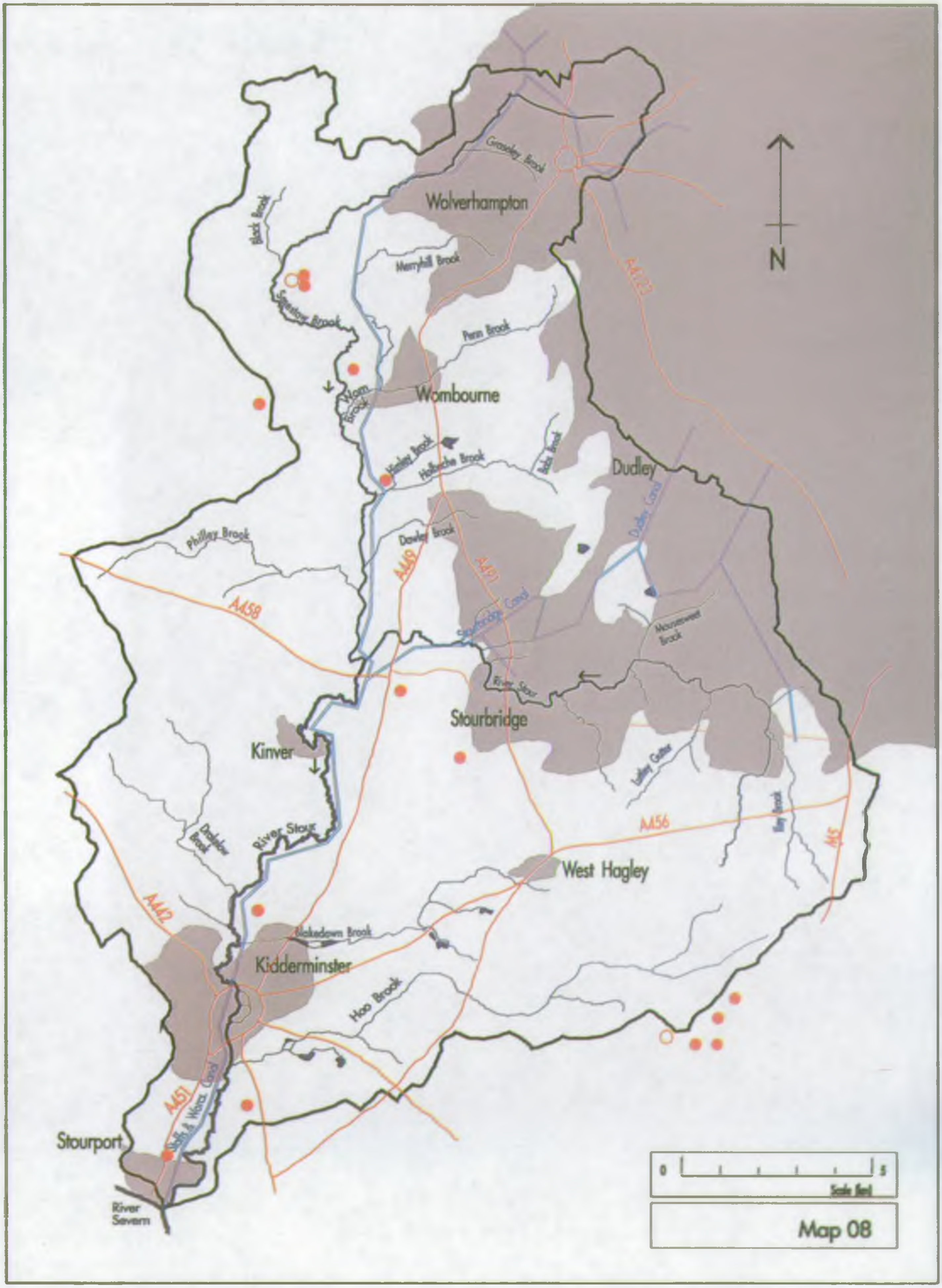
3.4.5 Objectives

The following objectives relate to the effect of contaminated land on groundwater quality - *See Issue C*

* To seek to ensure that waste disposal activity does not compromise water quality or water resources, and proceeds in accordance with advice given in the Policy and Practice for the Protection of Groundwater.

* To seek to ensure that redevelopment of contaminated land only proceeds where it has been demonstrated that ground and surface water quality will not be compromised.

* To seek to ensure that every opportunity to implement water protection measures, with regards to contaminated land, is taken.


N
Wolverhampton
Merryhill Brook
Black Brook
Smestow Brook
Penn Brook
Wom Brook
Wombourne
Holbeche Brook
Dudley
Dudley Canal
A4123
Philley Brook
Dawley Brook
A449
A491
A458
Stourbridge Canal
River Stour
Stourbridge
Kinver
Lutley Gutter
A456
M5
Drakelow Brook
West Hagley
A442
Blakedown Brook
Kidderminster
Hoo Brook
A451
Staffs & Worcs Canal
Stourport
River Severn
0
5
Map 08

3.5 Mineral Extraction

3.5.1 General

The activities associated with mineral extraction can have an effect on both ground and surface water quality, as well as on water resources and drainage.

The impact on water quality depends on the type of mineral, the method of extraction and the location of the mine or quarry. Coal mining can result in high toxic metal, sulphate and chloride concentrations; inadequate settlement of effluents from clay extractions will lead to high levels of suspended solids; on-site storage of fuel and other chemicals has the potential to leak and for the contents to enter the ground or surface water system. Natural purification occurs as water percolates through an unsaturated zone; this will be reduced if the zone has been removed.

See Section 3.4

Mineral extractions can also restrict the recharge of an aquifer and divert flow. This is especially so at sand and gravel workings, where dewatering operations are often necessary.

3.5.2 Local perspectives

A wide variety of minerals are extracted across the catchment. The Triassic sandstones, which occupy the centre of the catchment, are weakly cemented and are frequently worked for sand and gravel. The Carboniferous coal measures in the east have been exploited for many years, leaving many abandoned workings and disused shafts. The Carboniferous clays and marls in the Dudley and Wolverhampton areas are quarried for brick-making clays. This is particularly so near Himley, where there are several old and current pits. These quarries are frequently restored through landfill.

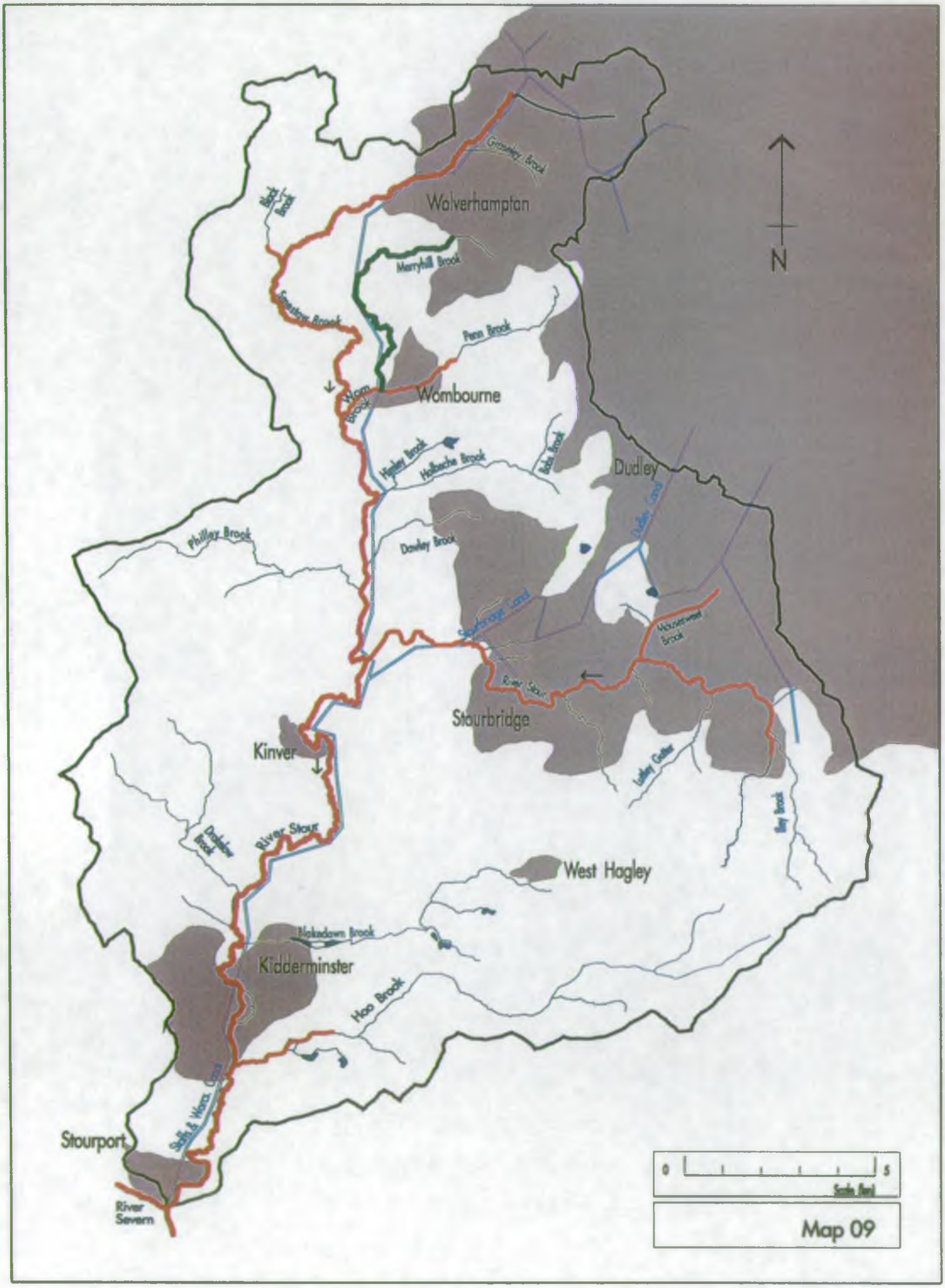
The existing and proposed mineral extraction sites listed in the Hereford & Worcester and the Staffordshire Local Mineral Plans are shown on Map 8. There are many more abandoned quarries and mines, the latter of which are likely to be listed in British Coal records, but are not marked on the map

Map 8	Mineral Extraction
River	Urban area
Canal	
Catchment boundary	Road
Existing mineral extraction sites	
Proposed mineral extraction sites	
NB. Identified in county mineral plans	

3.5.3 Objectives

* To seek to ensure that mineral workings are operated within the guidance of the NRA's Policy and Practice for the Protection of Goundwater.

* To seek to ensure that the effects of mineral extraction on the surface water system are minimised.



Wolverhampton
Merryhill Brook
Smestow Brook
Penn Brook
Wombourne
Holbeche Brook
Dudley
Dawley Brook
Philley Brook
Stourbridge Canal
River Stour
Stourbridge
Kinver
West Hagley
River Stour
Blakedown Brook
Kidderminster
Hoo Brook
Stourport
River Severn
N
0
5
Map 09

3.6 Surface Water Drainage and Flood Defence

3.6.1 General

This use relates to -

a) disposal of surface water from urban development and agricultural land

b) protection of people and property from flooding, including the use of both natural floodplain and man-made defences.

c) maintenance of appropriate water levels for agricultural and other uses.

A river system arises from the natural (or artificial) drainage of a surrounding catchment area, and the river channels within it should have sufficient capacity to accommodate most variations in annual flow. However, during extreme climatic conditions, it is expected that the flow will spill over into a clearly defined floodplain.

The degree of flooding is usually defined as the frequency at which flooding of a particular severity is experienced, and expressed as the return period in years eg. 1 in 50 years. Consequently, the effectiveness of flood defences can also be measured in these terms. For example, in urban areas, flood defences are typically designed to withstand a flood with a return period of 100 years.

Certain reaches of river in the catchment are formally designated as Statutory Main River; under Section 105 of the Water Resources Act, 1991, the National Rivers Authority has powers to exercise general supervision over flood defence and land drainage matters. The NRA has permissive powers regarding Main River; Local Authorities and riparian owners are responsible for ordinary watercourses in urban and rural areas, respectively

Map 9	Surface Water Drainage and Flood Protection
River	Urban area
Canal	
Catchment boundary	Road
Statutory Main River	
Proposed Main River	

Formal consent is required for all proposals which interfere with the bed or banks of any river or obstruct the flow thereof. The NRA uses its powers and Land Drainage Byelaws to determine applications for Land Drainage Consents in order to -

- prevent obstructions to river flow;
- maintain the natural storage within the floodplain and river channel
- retain access for maintenance.

The NRA also exercises control through seeking to obtain the co-operation and support of the Local Planning Authorities in restricting development which, if permitted, would be subject to flooding, and/or have an adverse effect on flooding elsewhere.

For properties which are at risk from flooding, the NRA operates a flood forecasting and warning service, and has an emergency workforce to ensure that flood defences are effective.

3.6.2 Local perspectives

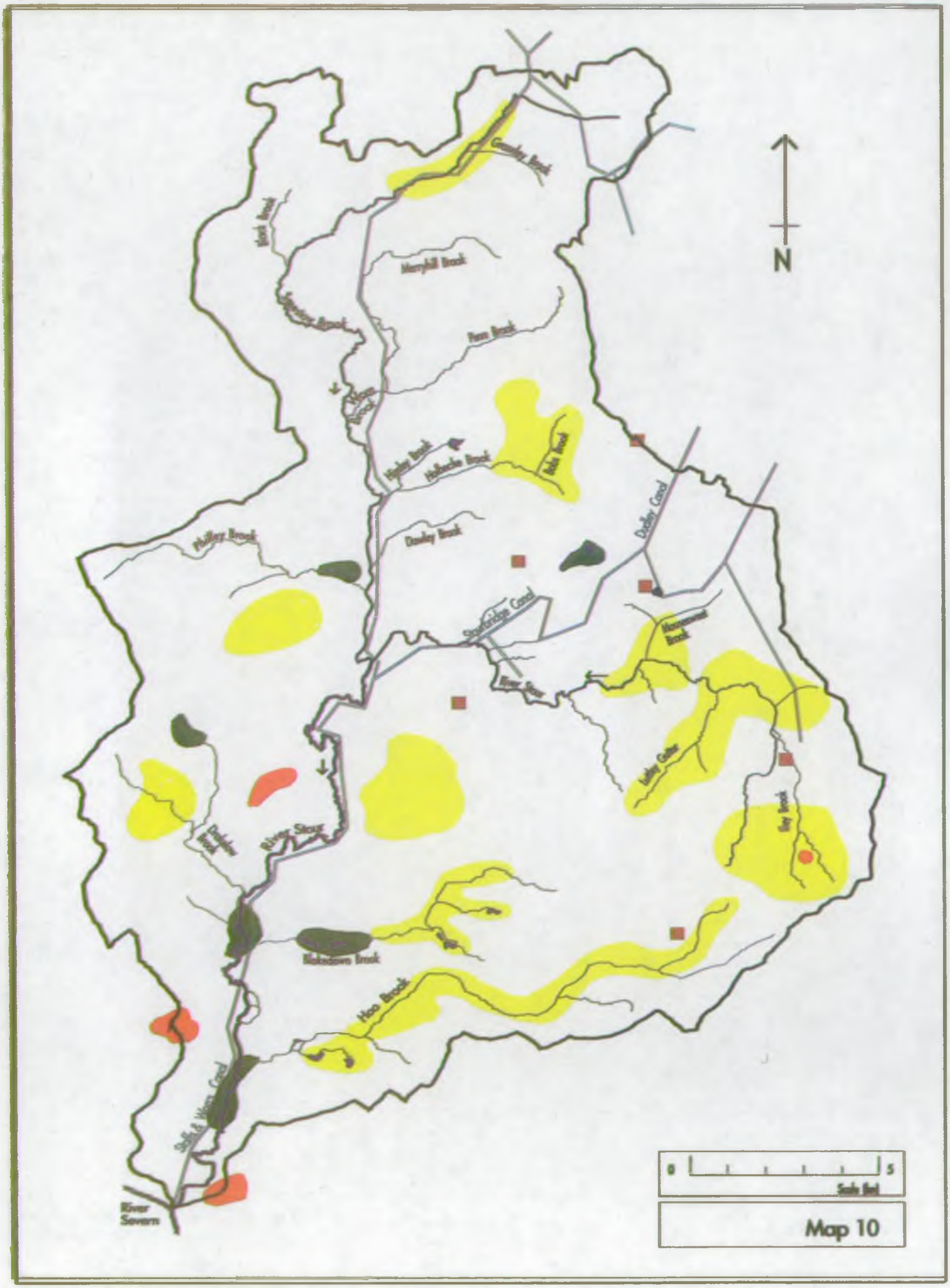
The surface water drainage, and subsequent problems which occur, in the Stour catchment are determined by a combination of physical characteristics -

- the north and east of the catchment forms the steep western slope of the watershed between the Severn and Tame valleys, making the area prone to heavy summer storms.
- the extensive areas of paving and significantly altered flow regimes, both due to urbanisation, have led to the principal watercourses responding very rapidly to rainfall, with artificially increased rates of flow.

A total of 80.9 km of watercourses in the catchment have been designated as statutory Main River (see Map 10), of which 10.5 km have been designated in 1992 and a further 6.5 km on the Merryhill Brook (Warstones Brook) are expected to be designated in the near future.

3.6.3 Objectives

* To prevent the creation or extension of flooding risks by influencing control over new development and over surface water run-off from such developments. *See Section 4.3.1.A*
* To provide cost effective protection for people and property against flooding from rivers. *See Section 4.3.1.B-D*
* To effectively operate existing defences.
* To provide cost effective drainage for agricultural use in a way which does not impinge unreasonably upon other uses. *See Section 4.3.1.B-C*
* To provide adequate arrangements for flood forecasting and flood warning, and for responding to flood events. *See Section 4.3.1.E*


N
Merryhill Brook
Pens Brook
Holbeche Brook
Dawley Brook
Dudley Canal
Stourbridge Canal
River Stour
Lutley Gutter
Blakedown Brook
Hoo Brook
Staffs & Worcs Canal
River Severn
0
5
Scale Bar

Map 10

3.7 Nature Conservation

3.7.1 General

This use relates to the protection and enhancement of all aquatic and water-dependent habitats, and their associated flora and fauna. The NRA has a duty, under the Water Resources Act, 1991, to promote the conservation of wildlife, and of geological and physiographical features in all its operations. It also has a general duty to promote the conservation of flora and fauna which are dependent on the aquatic environment.

3.7.2 Local Perspectives

Ecologically, the River Stour is a poor river. There is limited marginal vegetation and banks are frequently steep and colonised only by tall, rank vegetation and invasive exotic species. The poor water quality also restricts the instream diversity, favouring algal growth, with the pollution-resistant fennel pondweed often the only representative of higher plants.

The river banks within the West Midlands conurbation are, in the main, heavily engineered and hence of limited ecological value. Nevertheless, the general lack of habitat throughout the urban area gives the river an importance in the local context which it might not otherwise merit.

In its rural middle reaches, the Stour improves little, though earth banks provide nesting sites for kingfishers, which are relatively numerous, and the flood plain offers potential for habitat improvement.

Where it re-enters an urban area, through Kidderminster, the river is again impoverished in terms of habitat and plant communities. However, there is some improvement downstream, between the town and the River Severn, with the appearance of habitat features including frequent riffles, vertical cliffs and tree-lined banks. In these lower reaches, it is the habitat adjacent to the river which provides the primary ecological interest, including a number of important marshland areas.

Map 10	Nature Conservation
River	Urban area
Canal	
Catchment boundary	Road
Water-dependent SSSI's	
Other biological SSSI's	
Geological SSSI's	
Other sites of significant wildlife importance	

The Smestow Brook is similarly an impoverished river in ecological terms, lacking any significant aquatic flora. Thus high-lighting the need and opportunity for environmental enhancement in this catchment. Again, however, the brook's importance is emphasised in the urban area of Wolverhampton, where it forms a significant feature within an ecologically valuable linear park.

The Staffs.& Worcester Canal has a poor aquatic flora due to the constant suspension of bottom sediments. However, its marginal flora is of some interest, particularly where the canal runs parallel to the lower reaches of the Stour, with areas of marsh between the two watercourses.

See Section 4.1.2 & Issue B.10

There are 16 Sites of Special Scientific Interest within the Stour catchment, of which six are geological sites, three are heathland and one is grassland. The remaining six are water-dependent sites. These include marshland beside the River Stour at Wilden and Puxton, the open water sites of Fens Pools in Dudley and Hurcott on the Blakedown Brook, and areas of damp woodland at the Wilderness and Vermin Valley and at Checkhill. These are the key wetland habitats within the catchment which require protection.

In addition to the SSSIs there are a large number of other sites identified as being of significance for wildlife. These are termed Sites of Importance for Nature Conservation, Sites of Biological Interest and Special Wildlife Sites in the West Midlands, Staffordshire and Worcestershire respectively. These sites (all called SINCs hereafter) are generally distributed across the catchment, numbering approximately 200 in total, of which many will be water-dependent. Indeed, there are particular concentrations of SINCs along the Smestow Brook, the Stour in the urban conurbation, the Blakedown Brook and its tributaries, and the Hoo Brook.

The locations of the various SSSI's and SINC's are shown on Map 11.

3.7.3 Objectives

* To seek to increase the diversity of aquatic fauna and flora.

See Issue F.1-6

* To seek to ensure that opportunities to enhance the ecological value of the River Stour and its tributaries are taken.

See Issue A

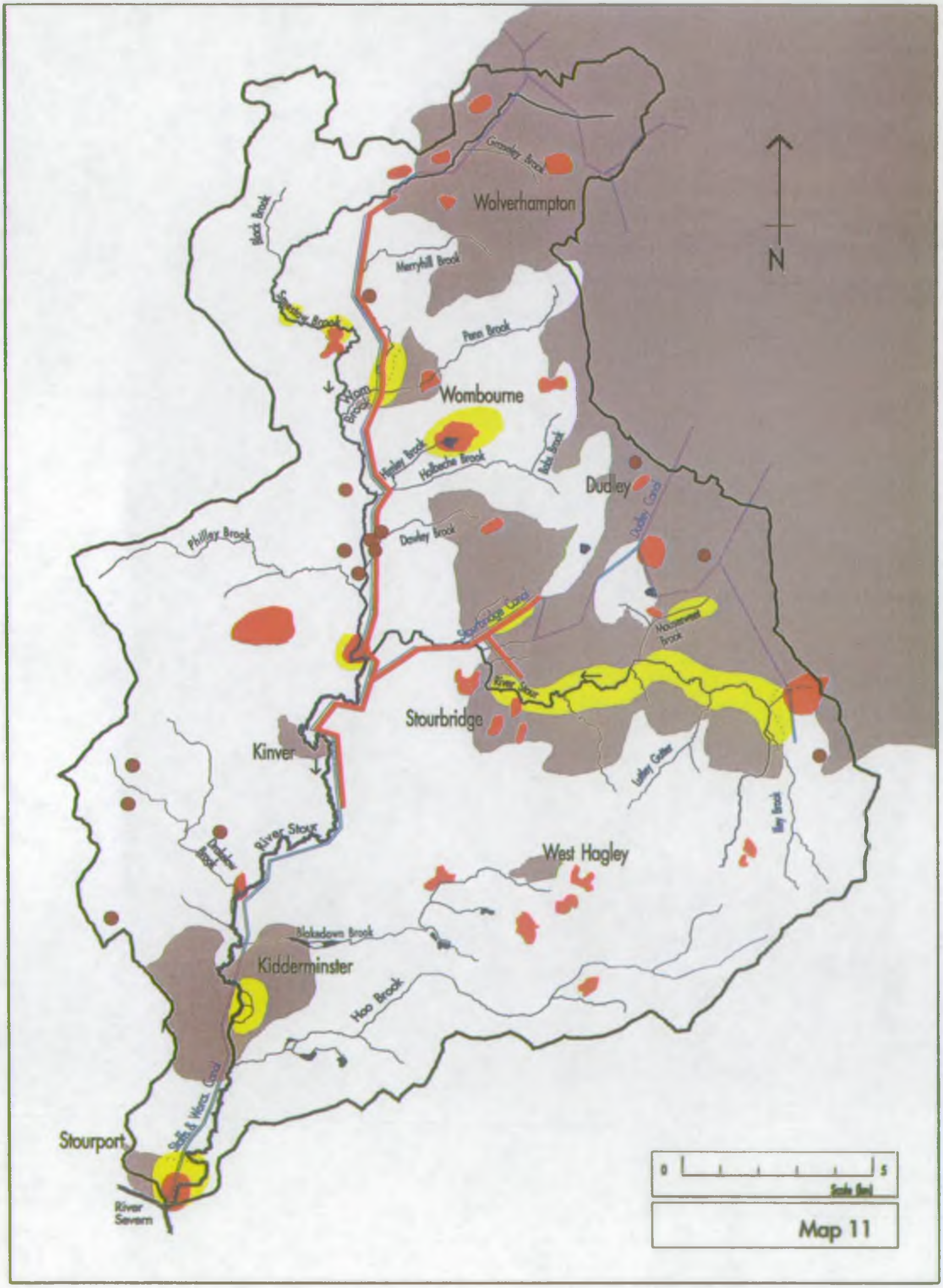
* To seek to ensure the protection of water-dependent designated sites (SSSIs and non-statutory SINCs).

3.7.4 Requirements

Water Quality - Progressive improvements in water quality.

Water Quantity - A water regime appropriate to the requirements of specific watercourses and designated sites.

River Engineering - Control of exotic invasive species.
The maintenance and enhancement of the diversity of natural river features and habitats.
River engineering activity should not cause the sites to lose their ecological interest.



N
Wolverhampton
Merryhill Brook
Black Brook
Penn Brook
Wombourne
Holbeche Brook
Dudley
Dudley Canal
Dawley Brook
Philley Brook
Stourbridge Canal
River Stour
Stourbridge
Kinver
Lutley Gutter
West Hagley
Blakedown Brook
Kidderminster
Hoo Brook
Staffs & Worcs Canal
Stourport
River Severn
0
5
Scale (km)

Map 11

3.8 Cultural Heritage

3.8.1 General

Rivers, canals and wetlands have often formed a focus for human activities, and many artifacts of earlier cultures - mills, bridges, navigational and fishing features - are preserved along river valleys. Under the Water Resources Act, 1991, the NRA is obliged to have regard to the desiribility of protecting and conserving buildings, sites and objects of archeological, architectual or historical interest.

3.8.2 Local perspectives

The significant industrial history of the Stour catchment has left a wealth of features of historic interest, many of which have been protected through statutory designations -

- 16 Scheduled Ancient Monuments (SAMs), several of which are particularly associated with watercourses -
    - Awbridge bridge, tow-path and lock
    - a cluster of Roman camps at Greensforge
    - Halesowen Abbey and fish ponds
    - a triangular crane at Bumblehole Boatyard
    - Baches Forge on the Blakedown Brook;
- numerous archaeological sites (identified on the Sites and Monuments Records) and listed buildings (designated by local planning authorities) are also associated with the watercourses;
- 29 Conservation Areas are designated with several matching up with concentrations of listed buildings. These include almost the entire lengths of the Staffordshire and Worcestershire Canal and the Stourbridge Canal

Map 11	Cultural Heritage
River	Urban area
Canal	
Catchment boundary	Road
Conservation areas	
Areas with concentrations of archeological sites	
Schedule Ancient Monuments (SAMs)	

Away from rivers, other SAMs and archaeological sites may be vulnerable to drying out through abstractions or land drainage, which would lead to the degradation of organic remains previously preserved in waterlogged conditions.

The locations of these sites are shown on Map 11.

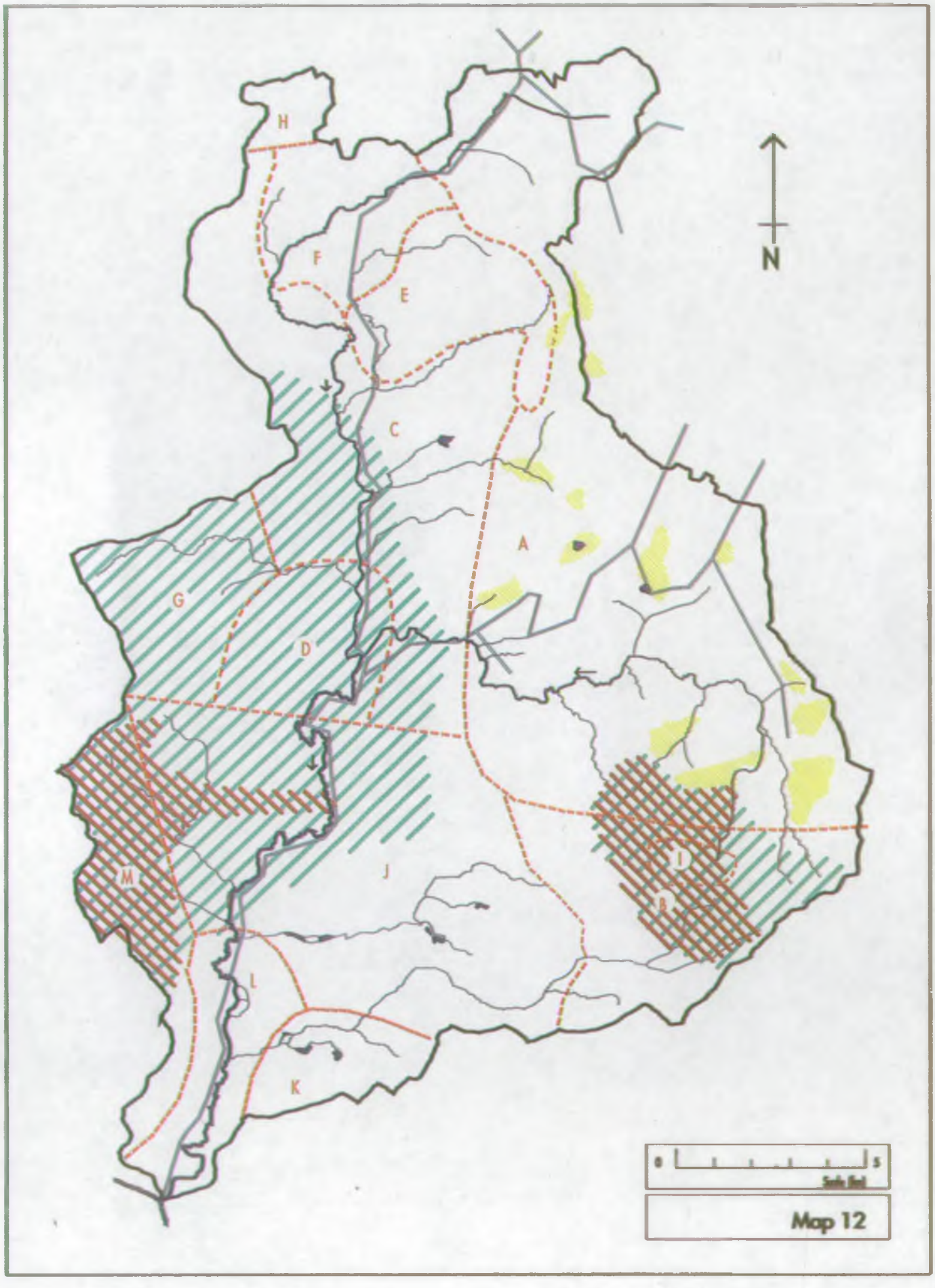
3.8.3 Objectives

* To encourage the protection of designated archaeological sites, associated with rivers, from direct destruction and from drying out.

3.8.4 Requirements

Water Quantity - The water table to be maintained at an appropriate level in wetland areas.

River Engineering - Where appropriate, for archaeological excavations to be undertaken in advance of, or a watching brief to be maintained during, the course of river engineering works.


H
F
E
C
A
G
D
M
J
I
B
L
K
N
Sindh Map
Map 12

3.9 Landscape

3.9.1 General

The physical landscape reflects a complex interaction of geomorphology, topography, drainage, vegetation and settlement patterns, providing a wide variety of landscape areas. Under the Water Resources Act, 1991, the NRA has a duty to promote the conservation and enhancement of the landscape in all its operations, as well as a general duty to promote landscape conservation.

3.9.2 Local perspectives

There are no nationally protected landscapes designated within the Stour catchment, ie. no Areas of Outstanding Natural Beauty or Environmentally Sensitive Areas. However, development plans covering the catchment do identify several landscape categories which are important in the local context (see Map 12).

Following a recent survey, the Stour catchment has been divided into several distinct landscape zones (see Map 12); the significance of the rivers and other watercourses as features in the landscape vary between them -

A The conurbation forms a dense urban environment, with linear open spaces along the rivers and canals.

B This is a typical urban fringe, with ancient semi-natural woodland within the narrow stream valleys.

C This area is dominated by arable landscape, featuring the north-south ridge of Abbots Castle Hill.

D North of Kinver is an area of arable farm land and plantations. The rivers and canals do not form a significant visual feature

Map 12	Landscape classification		
River		Urban area	
Canal			
Catchment boundary		Road	
Landscape classification area (from NRA survey, 1992)	A-M	Dudley Landscape Heritage Area	
Worcs, Area of Great Landscape Value		Wyre/Bromsgrove/South Staffs Landscape Protection Area	

E This is an area of small-scale ancient pastoral landscape, dissected by several steeply sloping valleys and heavily influenced by suburban encroachment.

F West of Wolverhampton is a zone of intensive arable farming on flattish land. The vegetation following the the Smestow Brook valley forms a significant linear feature.

G West of the Smestow Brook is an area mixed agriculture, with vegetation in the stream valleys again an important linear feature.

H To the very north is an area of intensely farmed arable land with no riverine features.

I The Clent Hills are characterised by heathy vegetation and steep wooded valleys and form the highest ground in the Stour catchment.

J This extensive area comprises rolling mixed farm land with a network of streams flowing to the Stour from differing directions.

K This is an area of generally unremarkable land.

L Within the lower Stour valley, Kidderminster and Stourport form a second significant urban area.

M The ridge separating the Stour from the Severn valley forms an undulating landscape with sandstone outcrops.

3.9.3 Objectives

Where the water environment is significant -

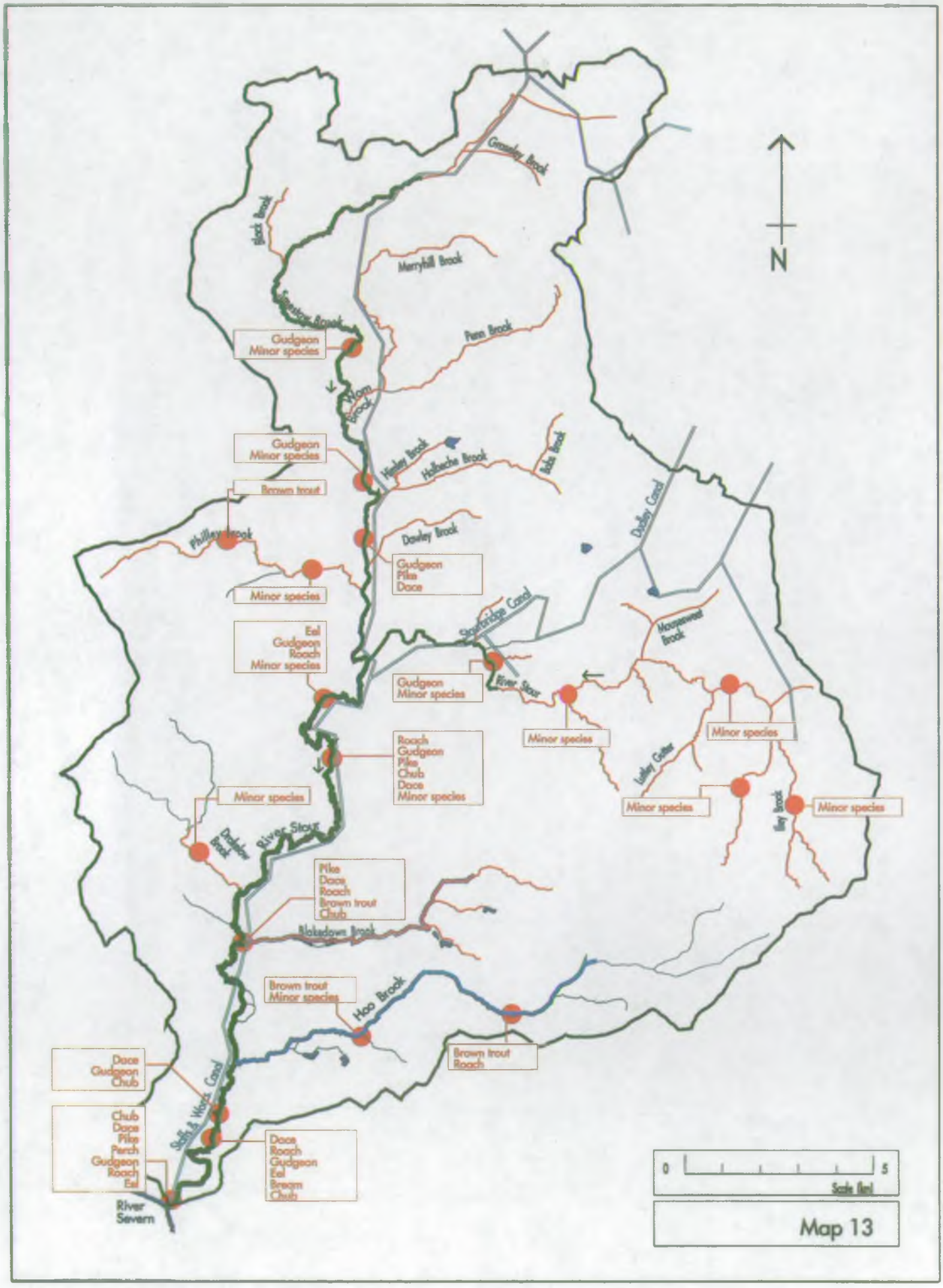
* To conserve and enhance the landscape of the catchment.

* To promote landscape conservation and enhancement.

3.9.4 Requirements

River management - Any developments and river management works must seek to conform to and conserve the local landscape character.

Opportunities to enhance the landscape where it is degraded will be identified and acted upon, where relevant to the water environment.


N
Black Brook
Merryhill Brook
Penn Brook
Gudgeon
Minor species
Worm Brook
Gudgeon
Minor species
Hadley Brook
Halbeche Brook
Bobs Brook
Brown trout
Dudley Canal
Pheasey Brook
Dowley Brook
Gudgeon
Pike
Dace
Minor species
Eel
Gudgeon
Roach
Minor species
Stourbridge Canal
Mousesweat Brook
Gudgeon
Minor species
River Stour
Minor species
Minor species
Roach
Gudgeon
Pike
Chub
Dace
Minor species
Lutley Gutter
Minor species
Minor species
Illey Brook
Minor species
Dudley Port
River Stour
Pike
Dace
Roach
Brown trout
Chub
Blakedown Brook
Brown trout
Minor species
Hoo Brook
Brown trout
Roach
Dace
Gudgeon
Chub
Staffs & Worcs Canal
Chub
Dace
Pike
Perch
Gudgeon
Roach
Eel
Dace
Roach
Gudgeon
Eel
Bream
Chub
River
Severn
0
5
Scale 6km
Map 13

3.10 Fisheries - Salmonid and Cyprinid

3.10.1 General

This use relates specifically to the maintenance of breeding populations of salmonid (salmon and trout) and cyprind (non-salmonid) fish. Where appropriate, the conditions necessary for successful migration between the river and sea are also included. Salmonids and cyprinids are protected under the EC Freshwater Fisheries Directive (78/659/EEC), which sets water quality criteria to protect fish life in designated freshwater reaches of inland watercourses. Additional freshwater reaches may be designated or existing reaches redesignated periodically.

Fish are sensitive to the general conditions in a river since they are near the top of the aquatic food chain. They are, therefore, important not just for their own presence, but also provide a good indication of the overall health of the river.

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

3.10.2 Local perspectives

The present distribution of salmonid fish in the Stour catchment is extremely restricted Although the majority of reaches offer suitable physical habitat, intermittent poor water quality in many watercourses is the limiting factor. The Hoo Brook was the only tributary supporting a population of brown trout in the most recent survey, although fish numbers and biomass were both low.

Cyprinid fish are widespread in the Stour catchment, but biomass and species diversity vary locally as a result of water quality.

Map 13	Fisheries - salmonid and cyprinid
River	Urban area
Canal	
Catchment boundary	Road
Cyprinid fishery	Survey site (1991)
Salmonid fishery	(+ species caught listed in
Reduced fisheries importance	order of descending biomass)
Not surveyed	
NB. As designated in NRA Fisheries Strategy	

Smaller species (sticklebacks, bullheads and stoneloach) are ubiquitous throughout the catchment. They dominate in the River Stour upstream of the Smestow Brook confluence, where poor water quality restricts populations of other species.

Downstream of the Smestow-Stour confluence, populations are more diverse and prolific, with a total of 13 species being recorded, of which roach, chub and dace are most frequent. Other species present include bream, pike, bleak, perch, eel and gudgeon.

Only one stretch of water is designated under the EC Fisheries Directive (78/659/EEC); 26.2 km of the Staffs.& Worcester Canal, between Swindon and the junction with the River Severn, is a designated cyprinid fishery.

Map 13 shows the various lengths of watercourse which are specified as either salmonid or cyprinid fisheries according to the NRA Severn-Trent Fisheries Strategy. The location sites fished in the 1991 survey programme, and the principal species caught are also shown.

3.10.3 Objectives

* To develop salmonid and cyprinid fish populations in order to provide fisheries of a quality appropriate to the existing physical and improving environmental characteristics of the catchment. *See Issue G.1-3*

3.10.4 Requirements

Water Quality	- Progressive improvements in water quality to allow long-term developments of the fisheries resource.	*See Section 4.1.2-3*
	Watercourses designated under EC Fisheries Directive (78/659/EEC) should not deteriorate below the limits specified.	*See Section 4.1.2-3*
Water Quantity	- Provision of a flow regime suitable to the considerable physical habitat quality of the individual watercourses.	*See Section 4.2*
River Engineering	- Provision of instream features to enhance fish habitat, in line with improvements in water quality and quantity.	


Wolverhampton
Grossley Brook
Black Brook
Merryhill Brook
Smestow Brook
Penn Brook
Wombourne
Worm Brook
Hagley Brook
Hollieche Brook
Bobs Brook
Dudley
Dudley Canal
Philley Brook
Dowley Brook
Stourbridge Canal
Mousesweet Brook
River Stour
Stourbridge
Kinver
Valley Gutter
Lay brook
Dunsley Brook
River Stour
West Hagley
Blakedown Brook
Kidderminster
Hoo Brook
Stourport
Staffs & Worcs Canal
River Severn
N
0
5
Scale (km)
Map 14

3.11 Angling

3.11.1 General

This relates specifically to the use of the catchment for angling.

3.11.2 Local perspectives

For much of the catchment the physical size and the relatively poor water quality of the river and brooks precludes wide spread angling. The main coarse fishing interest is centred on the Staffs.& Worcester and Stourbridge canals. Downstream of Kidderminster, the River Stour has sufficient water to provide organized angling, whilst there is some individual interest upstream. Little game fishing interest has been identified.

There is also little organised angling on still waters in the catchment. Pools at Himley, Shatterford and Pool Hall provide day-ticket facilities for coarse fishing, although Shatterford also operates as a day-ticket trout fishery.

The extent of angling in the catchment is shown on Map 14

3.11.3 Objectives

* To promote suitable and safe conditions for successful angling

See Issues G-H

3.11.4 Requirements

Water Quality - To maintain and improve water quality for the protection and enhancement of the watercourse for successful angling.

To maintain and improve water quality to be aesthetically acceptable in order to enhance angling.

Water Quantity - To provide sufficient flow so as to maintain and improve the river system for angling.

River Engineering - To facilitate access for anglers wherever appropriate.

Map 14	Angling		
River		Urban area	
Canal			
Catchment boundary		Road	
Canal angling			
River angling			
Stillwater day-ticket fisheries			


Wolverhampton
Wombourne
Dudley
Kinver
Stourbridge
West Hagley
Kidderminster
Stourport
River Severn
River Stour
Staffs & Worcs Canal
Stourbridge Canal
Dudley Canal
Grassley Brook
Black Brook
Merrybill Brook
Smestow Brook
Penn Brook
Worm Brook
Hockerley Brook
Holbeche Brook
Bobbs Brook
Dowley Brook
Pheliey Brook
Mockmoor Brook
Lutley Gutter
Bay Brook
Blakedown Brook
Hoo Brook
N
Map 15

3.12 Recreation and Leisure

3.12.1 General

This relates to the use of water and associated land for recreational purposes, and to the aesthetic aspects of the water environment.

The NRA discourages swimming in all rivers due to the risk of drowning and of contracting water-borne diseases.

3.12.2 Local perspectives

There is a limited number of waters of sufficient size to allow active waters sports in the catchment. The exceptions are Himley Great Pool, Pool Hall and Lodge Farm Reservoir which, although modest in size, are sufficient to provide dinghy sailing facilities (see Map 15).

The larger watercourses are a visual attraction in the countryside, situated only a short distance from the heavily populated conurbation. Access in rural areas is fair, although this tends to be at spot locations rather than as a linear feature.

Due to the degree of urbanisation, access in the conurbation and in Kidderminster is fragmented. In Dudley and Halesowen this limited access is recognized by the local authority and improvements are planned in an effort to create a green corridor for conservation and recreation centred on the river.

River reaches in urban areas are, however, unattractive. The channel and immediate corridor are heavily influenced by the built environment, and affected by the underlying poor water quality and frequent pollution incidents.

See Section 4.1.1-2 & 5

The canal tow-paths are extensively used by walkers and strollers and provide access to much of the Stour and Smestow valleys. The four long distance footpaths located in the catchment provide good access to the countryside (see Map 15) :-

Map 15	Recreation and Leisure		
River		Urban area	
Canal			
Catchment boundary		Road	
Country park		Staffordshire Way	
		North Worcestershire Path	
		Worcestershire Way	
Dinghy-sailing facilities		Old Kingswingford Railway Path	

The Staffordshire Way
The North Worcestershire Path
The Worcestershire Way
The Kingswinford Railway Path

The catchment is well served by a total of five country parks - Leapgate, Kingsford, Clent, Baggeridge and Highgate Common (see Map 15).

3.12.3 Objectives

* To promote suitable and safe conditions for recreation associated with the riverine environment. *See Issue H.1-2*

3.12.4 Requirements

Water Quality - To maintain and enhance the recreational value of the watercourse.

To maintain and enhance the aesthetic aspect of the watercourse.

Water Quantity - To maintain a water regime suitable to the appropriate recreational activities.

River Engineering - Promote recreational access to, and enhance the landscape features of, the watercourse.


Wolverhampton
Wombourne
Dudley
Stourbridge
Kinver
West Hagley
Kidderminster
Stourport
River Severn
Black Brook
Merryhill Brook
Penn Brook
Worm Brook
Himley Brook
Holbeche Brook
Bobs Brook
Dudley Brook
Pelhley Brook
Stourbridge Canal
Dudley Canal
Mousesweat Brook
River Stour
Lutley Gutter
Hoo Brook
Blakedown Brook
Staffs & Worcs Canal
N
0
5
Scale (km)
Map 16

3.13 Navigation

3.13.1 General

This use relates to the passage of vessels on waterways which have known statutory or common law rights of navigation.

The NRA has no statutory powers in respect of navigation in the Severn-Trent Region.

3.13.2 Local perspective

The River Stour from Stourport to Kidderminister was made navigable by earthworks constructed following a statute in 1666. The works were destroyed by floods in 1680 and never restored. The Staffs & Worcester canal, opened in 1772, made river navigation a redundant issue.

The current physical constraints of small size and shallow water of the natural watercourses now preclude any commercial or recreational boat traffic.

Two British Waterways canal systems, the Staffs.& Worcester and the Stourbridge Canals, provide extensive and well used navigation facilities. There are marinas located at Stourport, Greenforge, Merry Hill, Stourbridge, Withymoor and Hawne Basin and moorings at Stourton (see Map 16). The vast majority of present day boat navigation in the catchment is for recreational purposes.

Canoeing also takes place on the Stourbridge Canal. Notes provided for canoeists by the British Canoe Union suggests that the activity also takes place on the lower reaches of the River Stour, although this would occur infrequently.

3.13.3 Objectives

* To promote co-operative use of rivers which are established navigations.
* To minimise the adverse impact on other users of any potential extension of maintained navigations.

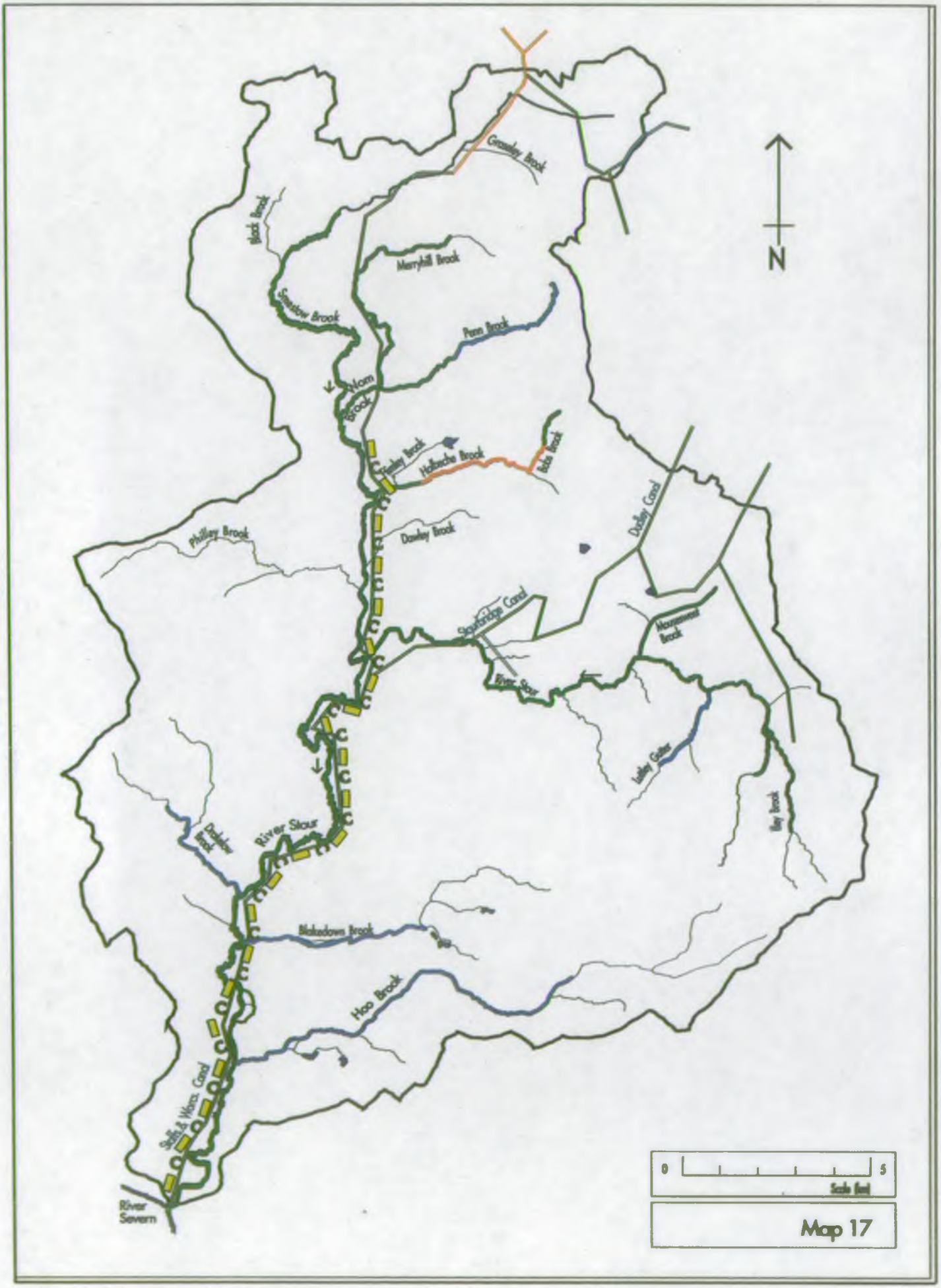
Map 16	Navigation
River	Urban area
Canal	
Catchment boundary	Road
Extent of Navigation	
Mooring/marina facilities	

4 Catchment Targets

Using the objectives identified in the previous section, a set of targets can be established for the improvement of the water environment of the whole catchment. A number of issues are identified by comparing these targets with the current status of the catchment. Issues arise where there is a failure to meet a specific target or where different targets have opposing requirements. These issues have been presented in a series of tables in Section 5.

For the purpose of this document, the current status and targets are discussed according to the three characteristics of -

Water Quality	(Section 4.1)
Water Quantity	(Section 4.2)
River Engineering	(Section 4.3)


Grassleys Brook
Black Brook
Merrylill Brook
Swindon Brook
Penn Brook
Worm Brook
Himley Brook
Holbeche Brook
Bobs Brook
Dudley Canal
Pudley Brook
Dawley Brook
Stourbridge Canal
Moorcroft Brook
River Stour
Lutley Gutter
Ley Brook
River Stour
Blakedown Brook
Hoo Brook
Staffs & Worcs Canal
River Severn
N
0
5
Scale Bars
Map 17

4.1 Targets and Status - Water Quality

4.1.1 General

Following the creation of the Water Authorities in 1974, the National Water Council (NWC) reviewed both the classification of river water quality and the policy on setting discharge consents. The classification system is based on a limited range of chemical criteria and enables a particular stretch of river to be assigned one of five quality classes. These classes are ranked, in order of decreasing quality, as 1A (very good), 1B (good), 2 (fair), 3 (poor) and 4 (bad) - these are detailed in Appendix 3 In 1979 the Water Authorities used this classification system as a basis to establish long term River Quality Objectives (RQOs) for the major rivers and canals in their areas.

As well as the RQO classification, European Commission (EC) Directives are also used to set quality targets for both ground and surface water.

a) the 78/659/EEC Fisheries Directive defines standards necessary to ensure that water quality is suitable for supporting fish populations.

b) the 76/464/EEC Dangerous Substances Directive deals with the discharge of substances considered harmful to the aquatic environment.

   NB. The Fisheries Directive applies only to designated stretches, whereas the Dangerous Substances Directive applies to all waters.

c) the Surface Water Abstraction Directive (75/440/EEC) must also be considered when setting consent conditions in the Stour catchment; the River Severn is heavily abstracted for drinking water downstream of both the River Stour confluence and Staffs.& Worcester Canal junction.

d) the Directive on Diffuse Pollution by Nitrates (91/676/EEC) will apply to designated areas where the groundwater is likely to contaminated by nitrates.

Map 17	Targets - Surface Water Quality
River	Urban area
Canal	
Catchment boundary	Road
Water Quality Class	
Class 1B (good)	Designated cyprinid fishery
Class 2 (fair)	(EC Directive 78/659/EEC) =
Class 3 (poor)	
Class 4 (bad)	

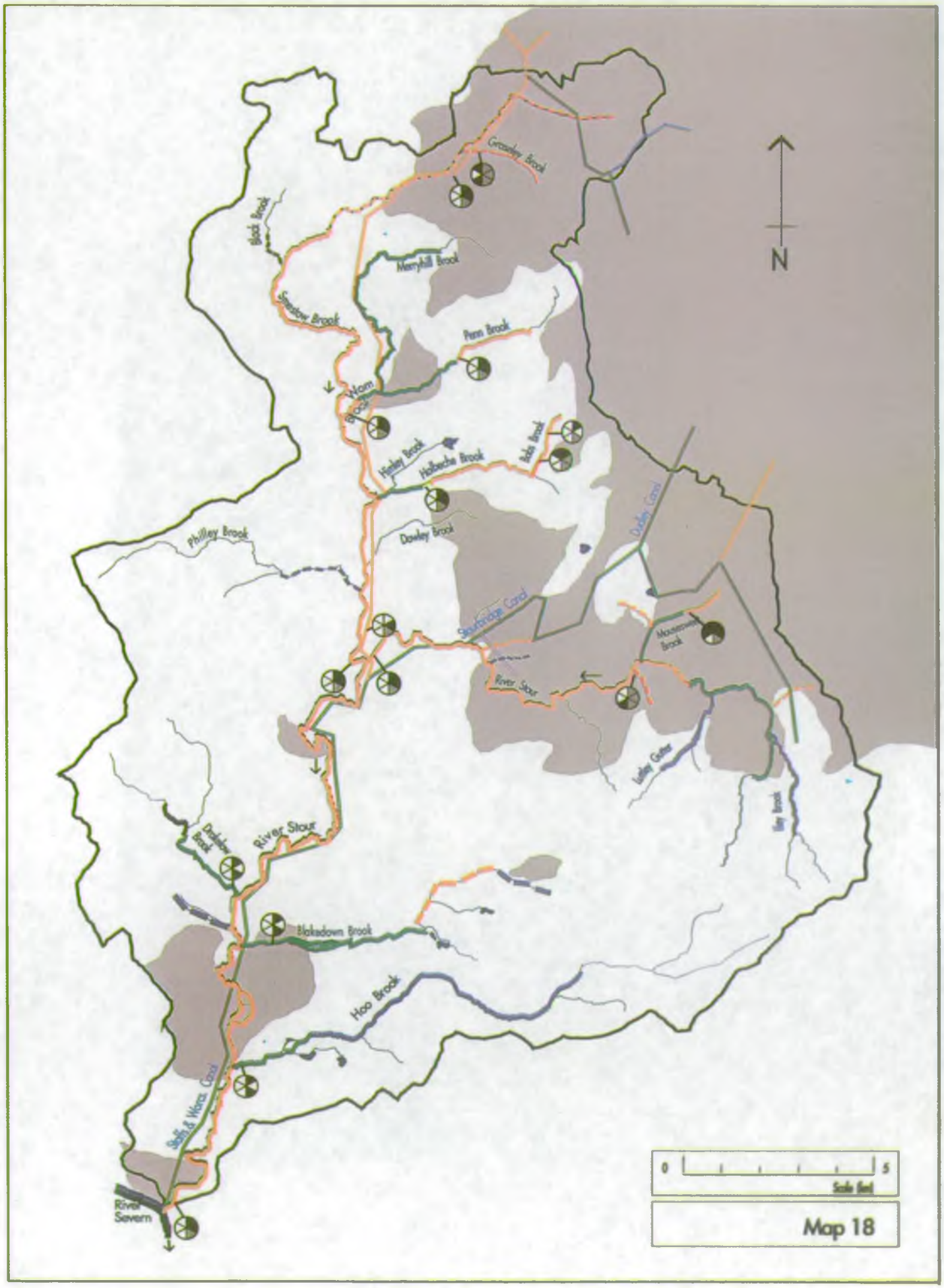
4.1.2 Local Perspectives - Surface Water

The Authority undertakes an extensive surface water sampling programme throughout the catchment; in the three years, 1989 to 1991, almost 3000 water samples were tested from 82 separate sites.

Map 17 shows the RQOs for the major watercourses in the Stour catchment, with map 18 showing the NWC classifications for 1991 and indicating the parameter(s) which cause a particular stretch to fail its RQO. Where a particular stretch does not have a RQO, its average quality over the last three years is shown as a broken line. (This information is detailed in Table 7 below). The NWC classifications given in this Catchment Management Plan take into account the data obtained during 1991. These are the most up to date classifications and supersede those reported in previously published documents.

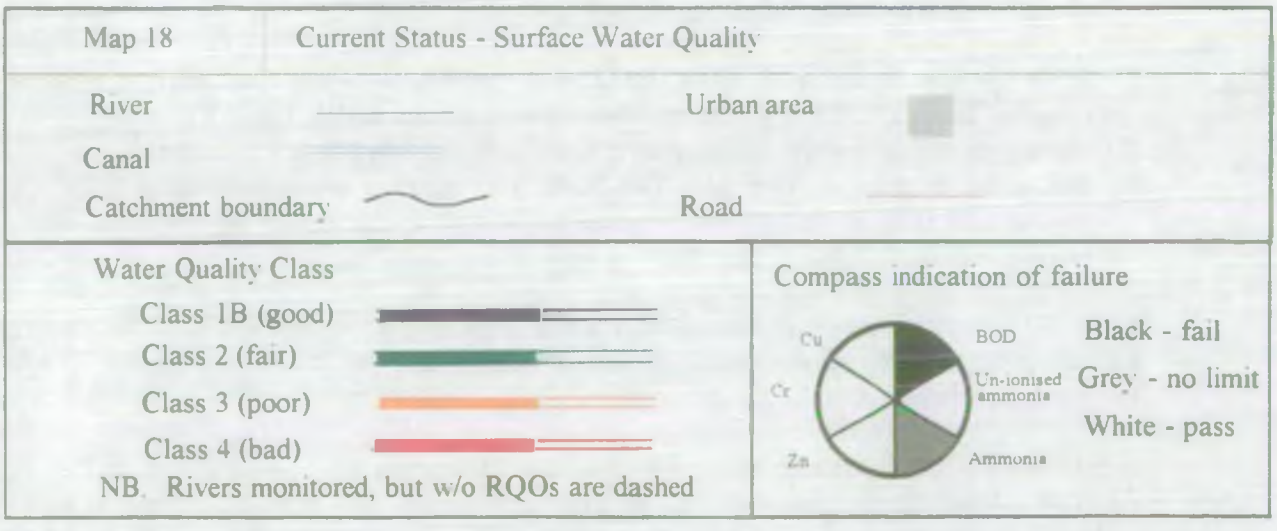
Map 17 also shows the location of the one stretch of water designated under the EC Fisheries Directive.

Watercourse	Location of Reach From	To	Present quality	River quality objective	Length (km)
River Stour	Hunnington	Cradley	2	2	5
	Cradley	**Confluence with River Severn**	**3**	**2**	**41.8**
Illey Brook	Lower Illey	Confluence with River Stour	1B	2	3.5
Lutley Gutter	Lutley	Confluence with River Stour	1B	1B	2.5
Mousesweet Brook	Upstream of Mousesweet	Confluence with River Stour	2	2	3
Smestow Brook	Dunstall Park	Trescott	-	-	5.8
	Trescott	**Hinksford**	**3**	**2**	**10**
	Hinksford	Confluence with River Stour	2	2	9.4
Black Brook	A454 Road Bridge	Confluence with Smestow Brook	-	-	1
Wom/Penn Brook	**Red Lane Bridge**	**A463 Road Bridge**	**3**	**1B**	**2**
	A463 Road Bridge	Wombourne WRW	2	2	3.1
	Wombourne WRW	**Confluence with Smestow Brook**	**3**	**2**	**0.5**
Merryhill Brook	Lower Penn	Confluence with Wom Brook	2	2	5.8
Holbeche Brook	Confluence with Bobs Brook	0.5 Km Downstream of Maidens Bridge	3	3	2.5
	0.5 Km Downstream of Maidens Bridge	Confluence with Smestow Brook	2	2	0.8


N
Grassley Brook
Black Brook
Merryhill Brook
Smestow Brook
Penn Brook
Worm Brook
Hinkley Brook
Holbeche Brook
Ashe Brook
Dudley Canal
Dowley Brook
Pholley Brook
Stourbridge Canal
Mousesweet Brook
River Stour
Lutley Gutter
Ley Brook
Dudley Brook
River Stour
Blakedown Brook
Hoo Brook
Staffs & Worcs Canal
River Severn
0
5
Scale (km)
Map 18

Bobs Brook	**Sedgley**	**Gornalwood**	**3**	**2**	**2**
	Gornalwood	**Confluence with Holbeche Brook**	**4**	**3**	**0.5**
Drakelow Brook	Spring Coppice	Drakelow	1B	1B	2
	Drakelow	**Confluence with River Stour**	**2**	**1B**	**2**
Blakedown Brook	**Churchill Lane Bridge**	**Confluence with River Stour**	**2**	**1B**	**5**
Hoo Brook	Belbroughton	A448 Road Bridge	1B	1B	8
	A448 Road Bridge	**Confluence with River Stour**	**2**	**1B**	**2.3**
Staffs & Worcester Canal	Cross Green	Compton Locks	3	3	3
	Compton Locks	Stourbridge Canal	3	2	17
	Stourbridge Canal	Confl R Severn	2	2	19.2
Stourbridge Canal	Dudley Canal Junction	Staffs & Worcs Canal Junction	2	2	5.5
Dudley Canal	Stourbridge Canal Junction	End at Halesowen	2	3	16.0
	Netherton branch: Dudley Canal Junction	Birmingham Level Junction	3	3	3
Birmingham & Wolverhampton Canal	Tipton	Staffs & Worcs Canal Junction	2	2	7

Table 7. Current NWC classifications and RQOs for classified watercourses in the Stour catchment (bold text indicates current failure of RQO).



Of the 112 km of river with RQOs, a total of 67 km (60%) fail to achieve their long-term target quality. Of some significance is the last 0.5km of Bobs Brook, as it is the only Class 4 stretch of classified river in the entire River Severn catchment. The stretch was down-graded to its current classification following a steady decrease in quality over the last few years. *See Issue B.1-2*

The failure to achieve the current RQOs is due mainly to discharges from sewage treatment works (STW) and sewer overflows.

Other minor contributory factors include :-

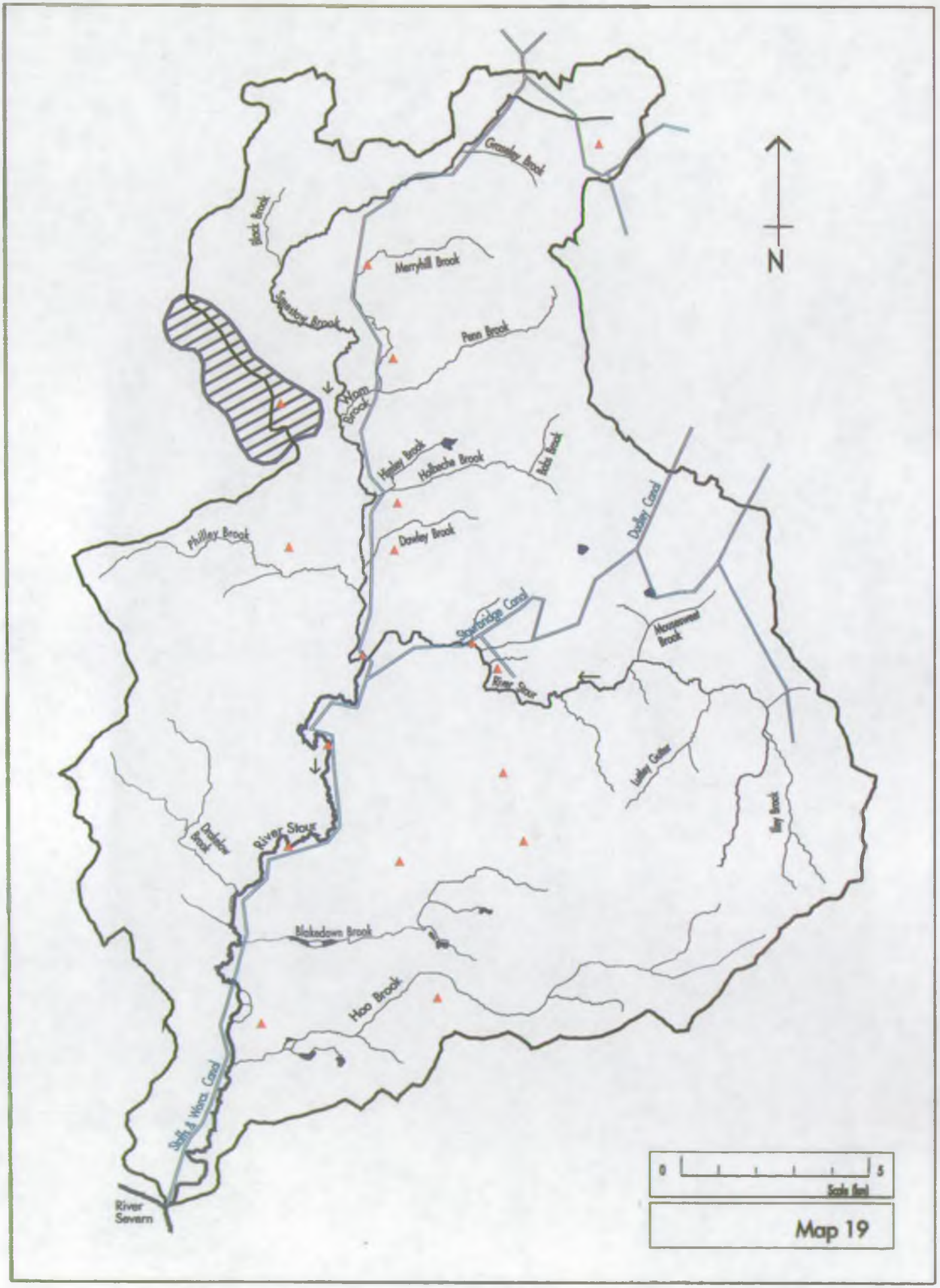
1. Surface water run-off from highly urbanised areas. *See Issue B.3-4*
2. Drainage from contaminated land and redundant waste-disposal sites. *See Issue C.1-2*
3. Unauthorised discharges of domestic and industrial effluents which enter the rivers via Severn Trent plc. surface water sewers and private drains. *See Issue B.5*

There are five sites in the catchment at which the concentration of one or more substances, specified under the EC Dangerous Substances Directive, was breached during 1991. These are :-

1. Bobs Brook, downstream of Lower Gornal STW - the limit for copper was exceeded as a result of high copper discharges from the STW.
2. Graisley Brook, at Compton - zinc, nickel and copper limits were exceeded following an illegal dumping of nickel plating sludge into the brook.
3. Mousesweet Brook, at Halesowen Road - chromium and copper limits are exceeded, due to a continuous discharge of drainage from an area of contaminated land. This discharge contains chromium in excess of 50 000 g/l, which results in a concentration in the brook of two and a half times the limit value. *See Issue B.6*
4. Salt Brook, at its confluence with the River Stour - the zinc limit is marginally exceeded, due to drainage from an old mine working.
5. River Stour, at Stourport - the limit for the pesticide Permethrin was exceeded by a factor of 10 as a result of discharges from Kidderminster STW. This STW also discharges Diazinon and Propetamphos, pesticides which are not specified in the EC Dangerous Substances Directive. The discharges, however, exceed the derived environmental quality standards for these substances by factors of 16 and 31, respectively. *See Issue B.7*

Of the 67 km of canals with RQOs, the only section which fails to meet its RQO is 18 km of the Staffs.& Worcester Canal, between Compton and the Stourbridge Canal junction. This failure is due to discharges from Barnhurst STW in Wolverhampton. *See Issue B.1-9*

In the Stour catchment, routine dredging of the canals to remove silt is no longer carried out. This has led to the accumulation of large quantities of organic material, toxic metals and other pollutants originating from treated sewage effluent, in the bed sediments. The organic deposits degrade anaerobicIly releasing large quantities of BOD, ammonia and, *See Issue B.10*


Gornalwood Brook
Black Brook
Merryhill Brook
Sweetbriar Brook
Penn Brook
Warm Brook
Hagley Brook
Hollacche Brook
Bobbs Brook
Dudley Canal
Pilley Brook
Dowley Brook
Stourbridge Canal
Monument Brook
River Stour
Ladley Gutter
Bay Brook
Dudley Brook
River Stour
Blakedown Brook
Hoo Brook
Staffs & Worcs Canal
River Severn
N
0
5
Scale 8km
Map 19

in extreme cases, sulphides into the canal water. The passage of boat traffic entrains these polluting sediments into the water column.

As the canals run alongside and overflow into the rivers, and leak into the aquifer, any reduction in the canal water quality will also result in the deterioration in both river and groundwater quality. Canal banks have, on occasion, burst, resulting in a surge of water and debris into the river. The large quantities of pollutants now present in the silt pose a serious pollution threat. *See Issue B.10*

4.1.3 Local Perspective - Groundwater

Twenty licensed boreholes in the Stour catchment are regularly monitored as part of the Regional Groundwater Chemistry Network. Their locations are marked on Map 19.

Groundwater from the Sherwood Sandstones aquifer is generally considered to be of good quality, with an abundance of calcium bicarbonate-rich water. However, certain areas yield poor quality water due to the effects of urban and industrial development, and intensive sewage spreading.

Few data are available on the water quality in the Carboniferous strata, to the north and east of the catchment. The information which does exist suggests that the quality is generally not as high as that in the Sherwood Sandstones, due to the nature of the aquifer and extensive industrial development.

The expected groundwater quality for the whole catchment is detailed in Table 8, below.

Within the urban areas, particularly Wolverhampton, Dudley and Kidderminster, the long history of heavy industry, gasworks and other activities have all had an impact on groundwater quality. The contaminants include heavy metals, hydrocarbons, pesticides and organic solvents. Often the contamination is widespread, with the effects of individual pollution sources coalescing to cover extensive areas. *See Issue C.1-2*

Map 19	Current Status - Groundwater Quality
River	Urban area
Canal	
Catchment boundary	Road
Groundwater chemistry network - Sampling borehole	
Area designated under Nitrate Directive	

Aquifer	Calcium mg/l Ca	Magnesium mg/l Mg	Sodium mg/l Na	Potassium mg/l K	Sulphate mg/l SO_4	Chloride mg/l Cl	Nitrate mg/l as N	Alkalinity mg/l $CaCO_3$	Electrical Conductivity Us/cm	Comments
Permo Triassic Sherwood Sandstones	30-110	3-15	10-30 generally 15 but can rise to 70+	2-6	12-80 occasionally higher in urban areas	10-45 occasionally up to 70+	Varies but generally <11.3	50-200	250-500	Nitrate levels in sources in urban areas or close to R Stour can exceed 11.3mg/l
Carboniferous Coal Measures	40-200	2-50 generally <30	5-30 occasionally higher - up to 200+ in West Midlands	2-20 generally <10	20-200 very variable - can be up to 500+. Generally higher in urban areas eg Coventry, Birmingham Stoke etc.	10-40 can rise to 600+ in parts of West Midlands	<0.1-20 can be even higher but generally less than EEC MAC	70-300 can be higher	250-1200 very variable generally higher in West Midlands	Variable quality due to heterogen-eous nature of strata. Quality could vary anywhere in this range.

Table 8. Expected groundwater quality for the aquifer types in the Stour catchment.


Wolverhampton
Grassleys Brook
Black Brook
Merryhill Brook
Smestow Brook
Penn Brook
Wombourne
Worm Brook
Himley Brook
Hollyhole Brook
Dudley
Dudley Canal
Pelham Brook
Dowley Brook
Stourbridge Canal
Mousemoor Brook
River Stour
Stourbridge
Kinver
Ley Brook
West Hagley
Kidderminster
Hoo Brook
Stourport
Staffs & Worcs Canal
River Severn
N
0
5
Scale (km)
Map 20

The EC Directive on Diffuse Pollution by Nitrates (91/676/EEC) requires member states to define vulnerable zones where nitrate concentrations in groundwater exceed or are likely to exceed the Maximum Allowable Concentration (MAC) for drinking water (50mg/l). In the Stour catchment, groundwater nitrate levels in the Sherwood Sandstone outcrop are approaching, or already above the 50mg/l limit. The aquifer will, therefore, fall in part within such a vulnerable zone. Land within such a zone should be managed so that the MAC for nitrate is not exceeded. Agriculture in the area is likely to be subject to change in order to comply with the directive in the long-term.

See Issue C.4

Under Section 94 of the Water Resources Act, 1991, the NRA may request the Government to make an order designating a water protection zone, in relation to practices leading to the contamination by nitrate. Ten Nitrate Sensitive Areas (NSAs) have been designated as part of a voluntary scheme to investigate methods of controlling nitrate levels in groundwater, for an initial period of 5 years. One such area has been designated surrounding the Tom Hill public water supply borehole, near Wombourne (see Map 19). Within this area farmers are encouraged to enter into agreements to follow a defined scheme of agricultural practices.

See Issue C.4

The intensive sewage spreading has led to increased nitrate and chloride concentrations in the groundwater. These will continue to improve in the future as the practice is phased out, in-line with the development of the Roundhill sewage sludge incinerator. However, significant improvements in water quality are not anticipated for many years.

See Issue C.3

There has been such a substantial decrease in groundwater quality, in the Stour catchment that the only reasonable target may be that it meets the standards set in the Water Supply (Water Quality) Regulations for potable supply and that there is no further deterioration.

There are groundwater quality problems in the catchment which will have a consequential effect on surface water, where the two interact. Problems are being addressed by the NRA, principally via liaison with developers, Planning Authorities and Waste Disposal Authorities. The NRA national "Policy and Practice for the Protection of Groundwater" provides policy statements on all aspects of groundwater pollution.

Map 20	Current Statuts - Biological Water Quality		
River		Urban area	
Canal			
Catchment boundary		Road	
Water Quality Class	Chemical water quality	Inferred Biological Quality	
Class 1B (good)			
Class 2 (fair)			
Class 3 (poor)			
Class 4 (bad)			

4.1.4 Local Perspective - Biological Quality

The quality of a watercourse can also be determined through examination of its macro-invertebrate populations (insects, crustacea, worms, etc.). Species react differently to changing water chemistry. Increasing organic pollution causes progressive loss of sensitive animals and reduces diversity. This is often accompanied by an increase in the numbers of tolerant animals. Toxic pollution, however, may remove all types of life, or cause a long term disruption to the natural community.

The interpretation of the sampled data is depicted as coloured symbols on Map 20. The inferred quality classes range from blue for sites with a community indicative of clean water, such as mayflies and caddis flies, to red for sites with only a few, very tolerant animals, such as Asellus (water hog louse), worms and leeches. The biological quality clearly reflects the poor chemical nature of the surface water system already described.

4.1.5 Local Perspectives - Potential Risks

Even where the underlying quality of a river is acceptable, a single pollution incident can adversely affect one or more of its legitimate uses.

Table 9 summarises the pollution incidents investigated by the NRA in the Stour catchment, over the 12 months to April 1992, and the principal activities which suffered as a result of individual incidents. One incident may affect one or more activities.

Pollution type	Total	Use affected			
		Abstraction	Conservation	Fisheries	Amenity
Chemical	13	1	3	0	12
Oil	55	1	8	0	49
Sewage	40	0	0	1	39
Food processing waste	3	0	0	0	3
Suspended solids	17	0	1	0	16
Farm waste	4	0	1	0	3
Colour	2	0	0	0	2
Foam	3	0	0	0	3
Other	18	0	1	2	14
Total	155	2	14	3	141

Table 9. Pollution incidents - 01-04-91 to 31-03-92.

The numbers and types of pollution incident reflect the urban nature of the catchment, with sewage pollution being the most frequent.

The figures indicate that the amenity of a river is very sensitive to pollution, with the highest number of incidents resulting in the water becoming visually offensive or malodorous. It should also be noted that because of the underlying poor water quality, other activities are already restricted and are less likely to be affected by pollution incidents.

See Issue B.8

The Authority takes steps to prevent pollution incidents by undertaking regular inspections of high risk sites, eg. pesticide stores, oil distribution/processing sites and waste disposal sites. Advice is also provided to concerned parties.

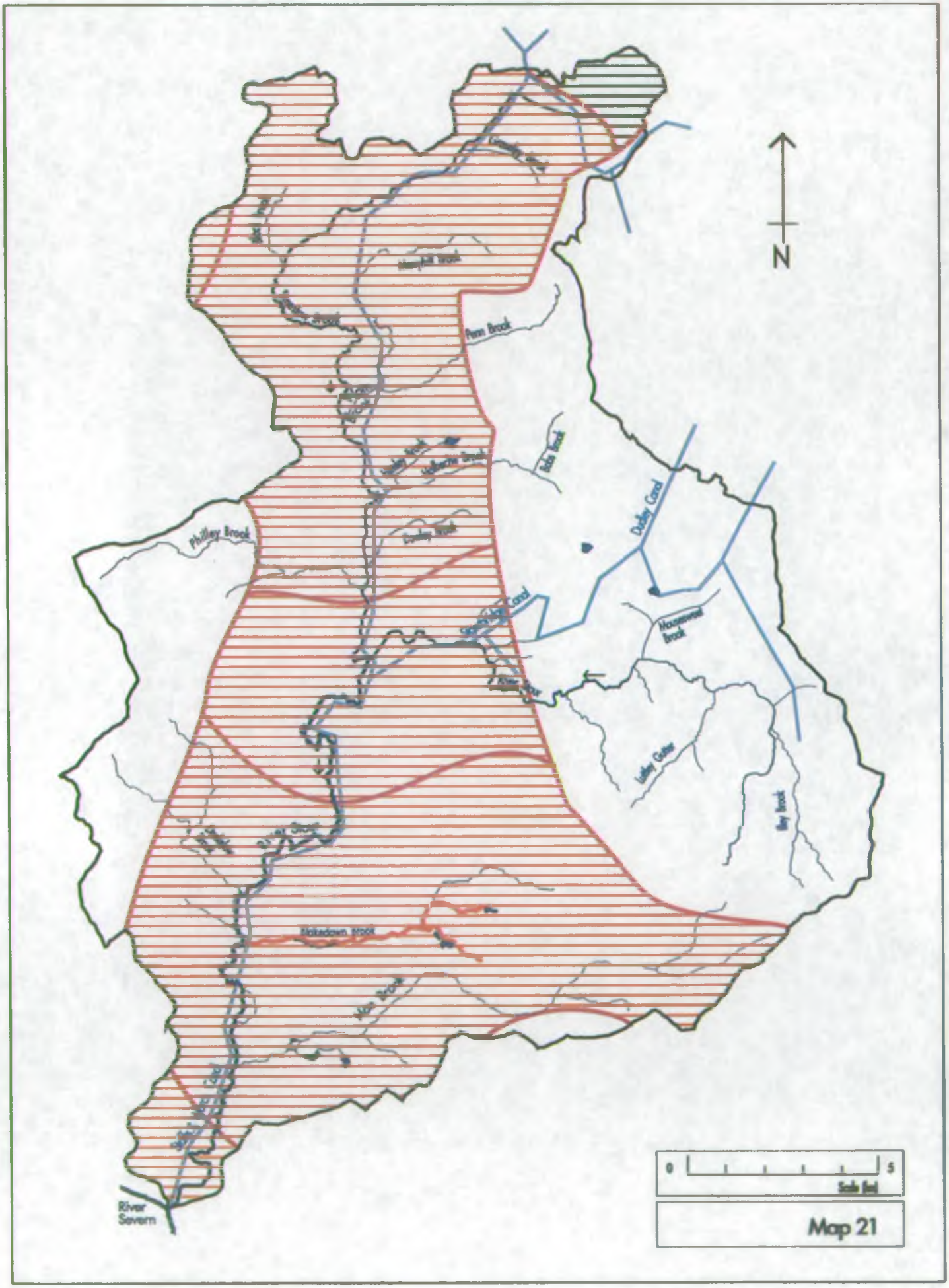
One of the potential threats to the aquatic environment is the escape of oil, or a related substance, from the pipelines used to transfer petrochemicals across the catchment. These pipelines lie only a few feet below the surface and any leak could seriously pollute both the ground and surface water. Both the NRA and the pipeline operators have detailed emergency plans, which can be rapidly implemented should a leak occur, and are tested by execises every year. High levels of surveillance and improvements in pipeline management have ensured that no major leaks have occurred in the Severn-Trent Region over the past 15 years.

Statutory Water Quality Objectives (SWQO)

The Water Resources Act, 1991, enables the Secretaries of State to introduce a system of classifying controlled waters and, through this system, to set Water Quality Objectives for specific bodies of water. Once set, the NRA has a joint duty with the Secretaries of State to ensure that these objectives are met, in so far as it is possible to do so, by exercise of the powers available to it.

Following public consultation, the NRA has formulated its proposals for a system of Water Quality Objectives, which, in October 1992, were submitted to the Department of the Environment for its consideration. The proposed scheme centres around the concept of having **use-related classes** which would apply to specific bodies of water. For example, there would be a specific set of water quality targets for stretches of rivers which are designated under the scheme as being cyprinid fisheries. The scheme will also embody any relevant EC Directives.

Should any of the waters in the Stour catchment be designated under the scheme, the present water quality targets (RQOs), identified in Section 4.1 will be replaced by the Statutory Water Quality Targets.


N
Penn Brook
Dudley Canal
Housewives Brook
Bay Brook
Phillley Brook
River Severn
0
5
Scale (km)

Map 21

4.2 Water Quantity - Current Status and Targets

4.2.1 General

The task of the National Rivers Authority, with respect to water resources, is to seek a balance between all legitimate demands and the needs of the environment. The environmental requirements are those to satisfy water quality objectives and the needs of fisheries and nature conservation.

Whilst the requirement for public consumption and agricultural and industrial abstraction can be readily measured, the environmental demand is more difficult to quantify. Previously, prescribed flows to satisfy environmental demands, have been based on low flow statistics, eg. the 95 percentile exceedance flow (Q95), or by more subjective means. Recently, a more objective approach is being investigated, identifying the specific flow requirements of individual watercourses and the aquatic ecosystems dependent upon them.

4.2.2 Local Perspectives

Ninety eight percent of abstraction in the Stour catchment is from groundwater sources, with more than 99% of this originating from the Sherwood sandstone aquifer. The urban nature of the catchment has led to public consumption being the single greatest demand on water resources, accounting for approximately 90% of all abstraction (by volume).

See Section 3.2.1

In order to protect the baseflows discharged to the surface water system and the groundwater resource generally, the licenseable resource of an aquifer must be significantly less than its long-term rate of recharge. For the Sherwood Sandstone aquifer area of the Stour catchment, this recharge is estimated at 164 Ml/d, whilst total licences, including industrial and agricultural, amount to 205.15 Ml/d and total abstractions to 164.04 Ml/d. The aquifer is, therefore, over-licensed and, in certain areas over-abstracted. As the rates of abstraction and recharge are effectively equal, baseflow discharge is likely to be compromised.

Map 21	Water Quantity - Targets and Status
River	Urban area
Canal	
Catchment boundary	Road
Groundwater management units	
Policy A management unit	Watercourses affected by depleted baseflows
Policy C management unit	
Policy D management unit	

The problem of over-abstraction in the catchment primarily stems from the issuing of large Licences of Right, following the introduction of the 1963 Water Resources Act. These licences did not take into account the proportion of recharge for baseflow protection and other environmental requirements.

For management purposes, the three major aquifers in the Severn-Trent Region have been sub-divided into 76 groundwater units. The Stour catchment overlaps six units for the Sherwood sandstone aquifer (see Map 21). In order to control the level of future licensing, each management unit is allocated one of three broad policies. These are outlined below - *See Issue D.2*

1. **Groundwater unit over-licensed and over-abstracted (category A) -** the firm policy is not to grant new or varied licences which will result in an overall increase in abstraction. For those units where there is evidence of severe over-abstraction, the NRA would seek to reduce total abstractions, either as a result of discussions with the Water Company concerned or, as a last resort, through the revocation of licences.

   There are currently 4 'A' category management units within the Stour catchment (see Map 21).

2. **Groundwater unit over-licensed and under-abstracted (category B and C)** - this policy covers two unit types, different in terms of hydrogeology. New applications are not readily dismissed as they would be in 'A' category units, but are subject to the following detailed considerations -

   a) the effect of existing abstraction on other groundwater abstractions and on the surface water system.

   b) whether the current rate of abstraction accounts for a small or large percentage of licensed abstraction.

   c) whether the water abstracted is to be returned to the same surface catchment encompassing the aquifer.

   Once an application is fully appraised by all relevant departments, within the Authority, then it can be -

   a) refused (for either category)

   or, in 'B' management units -

   b) be given favourable consideration, if the amount of water required is small and no adverse affects are anticipated in the future if the licence is issued,

   or, in 'C' management units -

   c) due to the complex hydrogeology of the area, the Authority will request that special detailed studies be undertaken. The applicant is warned at the outset that a licence will not necessarily be issued, or may be issued, but subject to special conditions.

There is currently 1 'C' category management unit within the Stour catchment (see Map 21).

3. **Groundwater unit under-licensed and under-abstracted (category D)** - in principal there are no objections to new licences being favourably considered, provided that the strict assessment, as applied in B and C category units, is made.

   There is currently 1 'D' category management unit within the Stour catchment (see Map 21).

Where possible, opportunities are also taken to reduce groundwater commitment, in order to safeguard long-term natural baseflows. To achieve greatest environmental gain in the Stour catchment, the largest reduction in abstraction would have to be concentrated in the area to the northeast of Kidderminster, where depleted groundwater levels have reduced baseflow in the Blakedown Brook (see Map 21) and caused the drying-up of several on-line pools. This reduction would be achieved through encouraging more efficient use of existing abstraction and promoting the use of alternative resources, eg. surface abstractions from the River Severn.

See Issue D.1-5

See Issue E.1-3

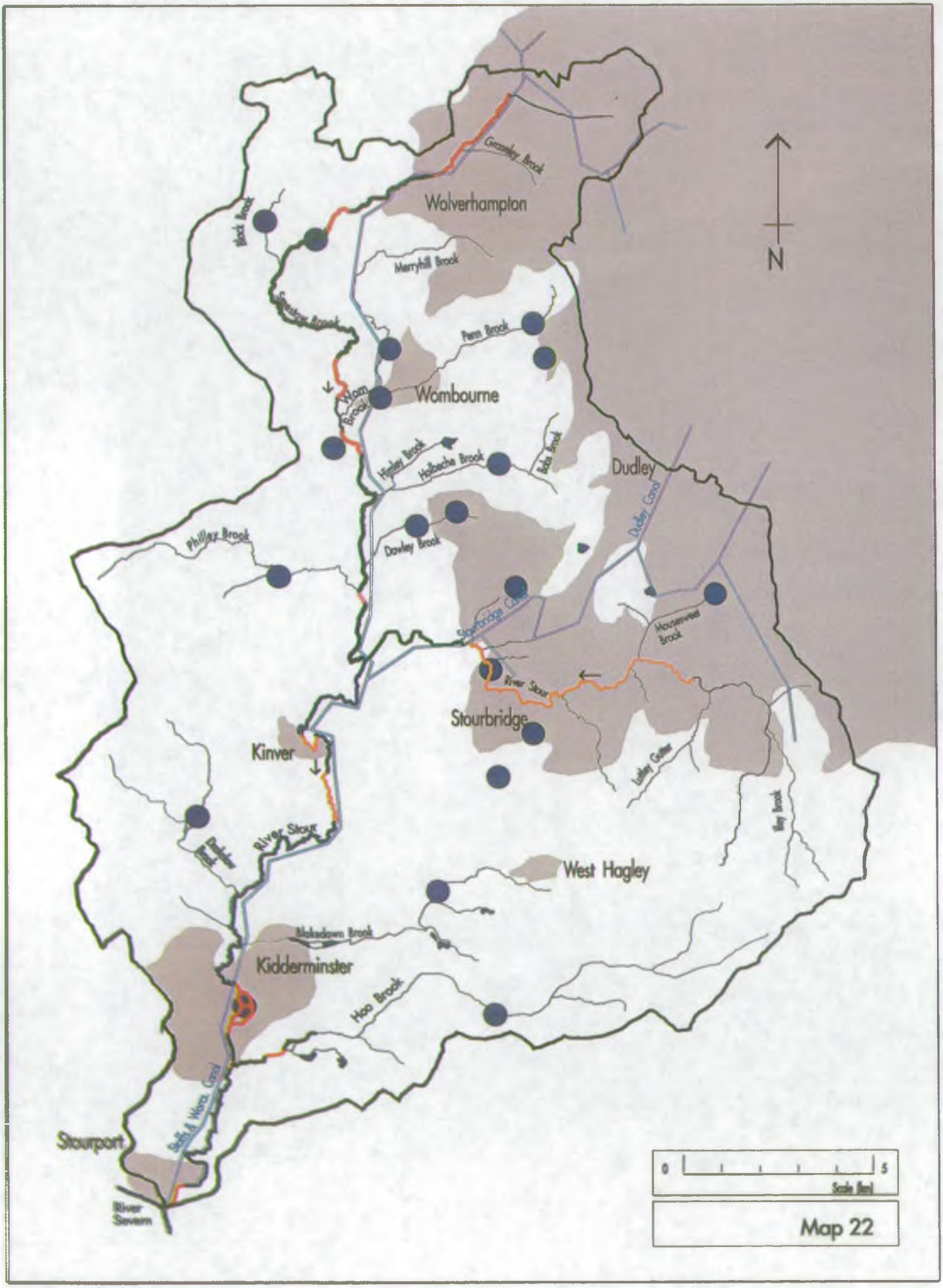
Development of alternative sources would be very costly and, therefore, it may be more feasible to artificially augment natural baseflows. This involves compensating existing flows from specific boreholes, or from mains water supply, thus satisfying environmental demands, whilst minimising the cost of mitigation.

There is already a study in-hand, run jointly with two water supply companies, to consider what sustainable long-term commitment of groundwater resources in the Blakedown area there might be. There is also a joint exercise underway to mitigate the effects on pools clearly affected by reduced flows.

See Issue E.2

Surface water abstraction, although only a small percentage of the total, can have more immediate affect on water resources. Spray irrigation, which accounts for the largest volume, is usually required during the summer months, at a time when river flows are at their most vulnerable.

Of the 68 spray irrigation licences, 47 are for surface water abstractions. A system is in operation to protect river flows by restricting irrigation by 23 licence holders. Licences are granted with the provision that irrigation must cease if river flows drop below a threshold value at specified control points. The system is hierarchical, with 15 (secondary) licences having to cease first, thus protecting the rights of 8 longer standing licence holders (primary).


Wolverhampton
Gospel Beck
Merryhill Brook
Penn Brook
Wombourne
Wom Brook
Hadley Brook
Holbeche Brook
Bobs Brook
Dudley
Dudley Canal
Dawley Brook
Phillips Brook
Stourbridge Canal
Mousesweet Brook
River Stour
Stourbridge
Kinver
Kinver Edge
River Stour
Lutley Gutter
Hoo Brook
West Hagley
Blakedown Brook
Kidderminster
Hoo Brook
Staffs & Worcs Canal
Stourport
River Severn
N
0
5
Scale (km)
Map 22

4.3 River Engineering - Status and Targets

4.3.1 Flood Defence Targets

It will always be impracticable to prevent all flooding in extreme climatic conditions. The task of the NRA, with respect to flood defence, is to protect people, property and land to standards which are practical, economic and appropriate. In general, this will be achieved by -

1. The preservation of natural flood plain areas;
2. Improving the carrying capacity of river channels and the provision of flood defences;
3. The maintenance of river channels and defences;
4. The control of surface water discharges to watercourses;
5. The provision of a flood warning service.

It must be emphesised that the target standards quoted below are, in all cases, targets which are subject to economic justification.

A - Floodplain - to seek to ensure no adverse loss of natural floodplain capacity.

Unless carefully sited and designed, new developments or redevelopment of existing urban areas can exacerbate the problems of flooding in areas downstream, through an increase in run-off from additional impermeable surfaces.

The NRA seeks to ensure that no development takes place in the floodplain where it could impede the flow or storage of flood water, and that appropriate control measures are taken on other developments to ensure that the risk elsewhere of flooding to people and property is not increased

Map 22	Targets and Status - River Engineering
River	Urban area
Canal	
Catchment boundary	Road
Riparian use categories - see Appendix	
Riparian use A	
Riparian use B	Location of specific flooding problem
Riparian use C	
Riparian use D	
Riparian use E	

The NRA is a statutory consultee to the Planning Authorities, and will continue to advise on the implications of development proposals on the natural watercourse systems in the catchment.

In addition, the NRA will utilise its statutory powers to ensure that any works associated with watercourses do not endanger life or damage land and property by increasing the risk of flooding.

Information on the areas at risk of flooding in the catchment is based on limited records. Detailed surveying and the development of a computational hydraulic model is required to determine more precisely the extent of the floodplain for various frequencies of flooding. Such a modelling project is currently being undertaken by the NRA and is due to be completed in early 1993. The model will also be used to demonstrate the effects of the historic development on the flow regime.

B - Channel Improvements and Flood Defences - these generally range, from -

a) **urban areas - to reduce flooding of urban areas to a frequency of once in every one hundred years, on average.**

to -

b) **rural areas - to reduce flooding of agricultural areas to a frequency of once in every five years, on average.**

In consultation with the Ministry of Agriculture, Fisheries and Food (MAFF) and where considered cost-effective, the NRA will carry out works on Main River to provide appropriate drainage for agricultural land and defences for urban areas..

C - River Maintenance - to optimise the flood carrying capacity of Main River watercourses.

Regular maintenance will be undertaken by the NRA to preserve the flood passing capacity in the Main River watercourses. All NRA maintained defences in the catchment will be included in the asset condition survey being carried out during 1992/93.

The main operational activities carried out in this catchment are obstruction/debris clearance, dredging and tree and bush maintenance. Maintenance frequencies vary according to the nature of the work to be carried out and the seasonal variations to river flows and vegetation growth. All maintenance activities are undertaken in accordance with environmental requirements.

Listed below are the target frequencies for each type of maintenance activity.

Obstruction/debris clearance - this is an ongoing activity due to the urban nature of parts of the catchment. Obstructions in the watercourse, such as debris at culverts are removed as necessary.

Dredging - Main River is desilted on average every 10 years. However certain locations have been dredged less frequently to a shallower depth due to the doubtful stability of bankside buildings. Culverts through Kidderminster require desilting on average every 5 years.

Tree and bush maintenance - this is carried out along the banks of Main River on average every 5-7 years, but more frequently, say every 3 years, where there are walls along the channel.

Flood Control - a maintenance programme for the recently constructed balancing lake on the Warstones Brook will be adopted by the NRA when the watercourse attains Main River status.

Weed Control - there has been no recent history of channel weed control in this catchment. If water quality continues to improve, there may be need in certain locations. Bank brushing is carried out 2-3 times a year in some reaches, such as at the upstream end of the Smestow Brook where channel capacity is low.

D - Surface water discharges - to seek to ensure that surface water discharges from new developments to not exacerbate flooding problems elsewhere in the catchment.

In responding to consultations on Local Authority Development Plans and individual planning applications, the NRA will comment on surface water drainage matters.

Where surface water disposal from new developments would create problems either on the recipient watercourse or elsewhere, the NRA would normally recommend that one of the following three options be considered:

a) Channel Improvements The receiving watercourse may be "improved" to the required standard. Works will only be approved if they could be carried out in an environmentally acceptable manner.

b) Surface Water Balancing/Storage Surface water balancing/storage may be permitted on or adjacent to the watercourse, particularly if a strategic approach is possible. For example, an on-line balancing lake has recently been constructed on the Warstones Brook to alleviate flooding problems and their future exacerbation by upstream improvements to the sewerage system in the urban area.

   Where a surface water balancing solution is adopted, the developer must demonstrate that adequate provision for the future maintenance of the balancing device has been made.

c) Source Control Where possible, the use of infiltration/percolation techniques are to be considered.

   There is scope for increased surface water control, from urban areas of the catchment, particularly in the upper reaches of the River Stour and Smestow Brook, and tributaries.

E - Flood Warning - to provide not less than 4 hours notice of fluvial flooding.

As part of its general supervision of all matters relating to flood defence, the NRA is responsible for the provision of a flood warning system for its area. The role of the NRA in any flood event is one of producing forecasts and of issuing warnings to the police, who in turn communicate the warnings to the public in flood risk areas.

The NRA operates a flood forecasting and warning service for the town of Kidderminster. he service currently provides at least 2 hours warning of serious flooding in the town.

The NRA is looking at ways to rationalise and improve the flood warning service. In particular, the introduction of a Flood Warden system similar to that currently in operation on the River Severn.

4.3.2 Local Perspectives - General

The growth of the West Midlands conurbation is causing constant pressure for development of the flood plains of both the River Stour and Smestow Brook. Increased surface water run-off from developments, and the progressive removal of mill installations from the main river channels, has given rise to increased river flows and consequent flooding problems (see Map 22). Major floods occurred in 1795, 1886, 1924, 1955 and 1960.

See Issue K.1-5

Historic urbanisation of the catchment has resulted in :-

a) encroachment of buildings into, and loss off natural floodplain areas.

b) unauthorised tipping

c) very high water-bourne debris loads, particularly during high flows.

In addition, peak rates of flow in the catchment, particularly in the eastern tributaries of the Smestow Brook, have increased in recent years due to the re-sewerage programme being carried out in Wolverhampton.

All of these contribute to and compound the flooding problems in the catchment. This makes the retention of the existing floodplain vital to avoid further exacerbation of these problems.

See Issue A.1

As land use varies, so therefore do customer interests and requirements for flood defence and surface water drainage. Different land uses have been brought together into five categories, ranging from A (heavily urbanised) to E (unintensive agriculture). These categories are detailed in Appendix N.

Within the Stour catchment, the Main River has been divided into reaches, and for each reach the predominant land use has been identified (see Map 22).

4.3.3 Local Perspecives - River Stour

Kidderminster is built at a natural constriction in the floodplain of the River Stour. The development of the carpet industry, which was originally driven by water power,

resulted in buildings being erected across the total width of the flood plain, with many structures built on (and forming part of) the banks of the river and, in some cases, spanning the river channel itself. Serious flooding over the past 200 years has caused extensive damage to industrial and commercial properties.

The decline in the use of water power has enabled the removal of many sluices and mill weirs, although some uneven gradients still remain. Since 1960, considerable redevelopment of the town centre has provided an opportunity to improve the hydraulic capacity of the river channel where possible. However, the principal constrictions to flow have remained unaltered, and flooding maybe expected to occur once in about six years, on average.

Various flood alleviation schemes have been completed/proposed, on the River Stour:-

Approximately 400 metres of flood embankments were constructed along the River Stour at Kinver in 1980 .

Also in 1980, an improvement scheme was completed at Wilden, where the River Stour was diverted to protect Wilden Industrial Estate, as well as agricultural land.

In 1990, the NRA completed a mathematical model study of the River Stour through Kidderminster and looked at options for flood alleviation in the town. The current preferred scheme which would protect upto 40 commercial properties depends upon proposals to redevelop the Brinton's carpet factory site in the centre of the town, which occupies the major area of flood flow restriction on the River Stour. These proposals, which will be subject to a full environmental assessment, provide an opportunity to rationalise the use of the floodplain, to improve flow efficiency and channel capacity, and to alleviate the chronic flood hazard. Construction work on the scheme is unlikely to commence before 1996, at the earliest, because the proposed redevelopment at the Brinton's site has been deferred until economic conditions are more favourable.

See Issue I.1-2

4.3.4 Local Perspectives - Smestow Brook

Upstream of Dunstall water bridge, which is the Head of Main River, the brook has been improved and culverted by Wolverhampton MBC. However, the full capacity of the culverted section is three times the capacity of the natural river channel to which it would discharge. Flows emanating from the culverts are currently throttled because of the limited capacity downstream. Although some improvements to the watercourse have taken place downstream of the Tettenhall Road (A41), the section of channel between Dunstall Water Bridge and Tettenhall Road is currently a bottle-neck. This results in flooding to Wolverhampton racecourse and a number of properties in the Aldersley area.

Simple enlargement of this section of the channel is not a practical solution as such works would simply transfer flooding and erosion problems downstream, without alleviating them. This would also be unacceptable from a water quality point of view, as increased volumes of contaminated urban drainage would be allowed to pass into the Smestow Brook. Any resolution of the flooding problem must also address the problem of water quality.

Discussions on possible solutions are continuing between the NRA, Local Authorities and Severn Trent Water Ltd, and are likely to involve a combination of river improvement and sewerage works. The solution is further complicated by Dunstall Water Bridge being a listed building and any channel improvements would be within a conservation area.

See Issue J.1-2

5 Issues

The following tables consider the issues which have been identified in the preceding sections. Each table discusses a separate issue and suggests a number of actions which may be required for the successful resolution of the problem.

The options and timescales listed are the initial thoughts of the NRA Severn-Trent Region and are put forward for public consideration. They do not constitute policy statements.

Wherever possible, the bodies responsible for particular actions have been identified. These may, necessarily, include individuals and organisations other than the NRA.

The proposed actions are now open for public consultation. If you wish to comment on these, or on any other issues which you feel require consideration by the NRA, please write to -

R P Lidgett
River Stour CMP
National Rivers Authority, Severn-Trent Region
Sapphire East
550 Streetsbrook Road
Solihull
B91 1QT

The following abbreviations have been used in the issues tables -

NRA	National Rivers Authority
STW Ltd	Severn Trent Water Ltd
BW	British Waterways
ADAS	Agriculture Development and Advisory Service
DoE	Department of the Environment
MAFF	Ministry of Agriculture, Fisheries and Food
MBC	Metropolitan Borough Council
STWs	Sewage Treatment Works
RQOs	River Quality Objectives

Issue A - Impact of urban development on all aspects of the water environment, specifically through - i) increased effluent loading of STWs ii) contaminated land iii) increased demand for potable and non-potable water supply iv) encroachment of development on floodplain				Significance - High
Actions	Responsible parties	Benefits	Implications	Timescale
1. Direct influence in planning process by seeking adoption of NRA model policies in development plans	NRA Local Planning Authorities	New development/redevelopments would have regard for constraints aimed at preserving the water environment	Impinges on Local Authority control and enforcement	On-going
2. Encourage environmental enhancement as part of development/redevelopment	Developers	As above	Potential cost to developers	On-going

Issue B - Under-lying poor surface water quality throughout catchment, specifically - i) non achievement of River Quality Objectives ii) breaches of EC Dangerous Substances Directive			Significance - High	
Cause - i) Discharges from STW and sewer overflows ii) Surface water run-off in highly ubranised areas iii) Drainage from contaminated land and redundant waste-disposal sites iv) Illegal discharges of domestic, agricultural and industrial effluents				
Action	Responsible parties	Benefits	Implications	Timescale
1(a) Review discharge consents for STW's and agree timetable for improvements with dischargers 1(b) Improvements in STWs	NRA (STW) Ltd	Progressive improvements in water quality, accompanied by an overall improvement in ecological conditions	 Extensive capital cost to dischargers	Mid-1993 1997 +
2(a) Investigate performance of sewerage system and sewer overflows 2(b) Improvements in sewerage system	NRA (STW) Ltd	As above	 Extensive capital cost to dischargers	1995 2000
3 Hoo Brook - Investigate impact of urban drainage from Kidderminster	NRA	As above	Possibly no practical solution	1995
4 Investigate use of settling lakes to treat urban run-off	NRA	As above Settling lakes would also act as flow balancing ponds and reduce localised flooding problems	Extensive capital and maintenance costs Land use implications	1994

Issue B cont				
Actions	Responsible parties	Benefits	Implications	Timescale
5. Trace and stop illegal discharges	NRA	Progressive improvements in water quality, accompanied by an overall improvement in ecological conditions	Potential cost to NRA and Local Authorities	On-going
6. Investigate sources of pollution leading to failure of RQOs and EC Dangerous Substances Directive, eg, Mousesweet Brook	NRA	As above	Resource intensive	1995
7. Reduce levels of pesticides in trace effluents from carpet manufacturers	STW Ltd Carpet manufacturers DOE NRA	Reduce concentrations of pesticide in river system to an acceptable level	Cost to carpet manufacturers	Already initiated
8. Continue to inspect high risk sites, eg, pesticide stores, etc, and give advice to developers	NRA Developers	Continued protection from serious pollution incidents	Cost to NRA and developers	On-going

Issue B cont				
Actions	Responsible parties	Benefits	Implications	Timescale
9. Staffs & Worcester Canal - investigate the feasibility of redirecting treated sewage discharges to Smestow Brook/River Penk	STW Ltd BW NRA	As above Improved water quality in canal Increased water flow in receiving watercourse	Insufficient water for canal operation River Penk discharges may create legal difficulties Increased flows may require channel improvements Must be in-line with improvements to STW, otherwise would reduce water quality of receiving watercourse	1995
10. Staffs & Worcester Canal - routine dredging to remove contaminated sediment, with disposal of licensed sites	BW		Cost to BW	Preparatory work already initiated

Issue C - Continued protection and improvement of groundwater quality				Significance - High
Cause - i) contaminated land, due to industrial development and waste disposal activity ii) previous intensive irrigation of treated sewage effluent and sludge spreading iii) diffuse nitrate pollution				
Actions	Responsible parties	Benefits	Implications	Timescale
1. Development, including that of contaminated land and waste disposal sites, should only proceed where it has been demonstrated that groundwater quality will not be comprised	Developers/landowners Local Waste Disposal Authorities Local Planning Authorities NRA	Safeguarding of groundwater quality	Capital cost to landowner/ developer to clean up contaminated land	On-going
2. Waste disposal activity should only proceed in accordance with advice given in the Policy and Practice for the Protection of Groundwater	As above	As above	Cost to site operator	On-going
3. Continued phasing-out of sewage sludge spreading	STW Ltd NRA	Safeguarding of groundwater quality	Sewage sludge incinerator already being developed	

Issue C cont				
Actions	Responsible parties	Benefits	Implications	Timescale
4. Encourage farmers to adopt alternative farming practices	Farmers MAFF/ADAS NRA	As above	Disruption to farming practices	On-going

Issue D - Demands for water exceeds long-term sustainable yield available in the catchment				Significance - High
Cause - Current licensable resources of Sherwood Sandstone is significantly greater than long-term rate of recharge				
Actions	Responsible parties	Benefits	Implications	Timescale
1. Promote use of alternative resources	Water supply companies Abstractors NRA	Long-term sustainable use of resource Long term protection of baseflows	Potential extensive cost to abstractors to develop alternative resource	2005
2. Adopt policies to prevent further licensing of resource	As above	As above		
3. Revocation of existing licence rights, with compensation	As above DOE	As above	Compensation costs	
4. Seek legislative change to gain greater control over licencees	NRA DOE	As above		
5. Encourage more efficient use of existing sources	NRA Abstractors	As above		

Issue E - Some watercourses suffering from low flows, eg, Blakedown Brook			Significance - High	
Cause - Current abstraction for public water supply is greater than sustainable resource				
Actions	Responsible parties	Benefits	Implications	Timescale
1. As issue D	Water supply companies Abstractors NRA	Return of 'natural' flow to water-courses and pools	Issue D	2005
2. Localised short-term compensation measures to augment flows, where appropriate	As above	As above, but reduces cost and disruption to public water supply	Cost to NRA	1993/94
3. In-stream engineering works to return natural flow regime	Local wildlife trust NRA Local Authorities	As above		

Issue F - Low biological diversity of riverine environment				Significance - High
Cause - Unsuitable environmental conditions and low physical habitat value i) poor underlying surface water quality ii) low/inconsistent flows in some watercourses iii) river channels heavily engineered/urbanised				
Actions	Responsible parties	Benefits	Implications	Timescale
1. Improve underlying water quality - see Issues B & C	Issues B & C	Progressive improvements in conditions suitable to an increase biological diversity	Issues B & C	Issues B & C
2. Reduce groundwater commitment - See Issue D	Issue D	As above	Issue D	Issue D
3. Short term remedial action to artificially augment low flows - see Issue E	Issue E	As above	Issue E	Issue E
4. Seek improvements in physical habitat as part of urban development/redevelop-ment - see Issue A.2	Issue A.2	As above	Issue A.2	Issue A.2
5. Control of invasive plant species (Himalayan Balsam)	Riparian owners Local Authorities NRA	Increase in diversity of riparian flora	Land owner is under no obligation to implement control measures Cost to land owner in imple-menting control measures	On-going
6. Improvements to instream habitat, through introduction of in-channel features	NRA	Provision of suitable physical habitat in-line with improvements in environmental conditions	Cost to NRA	In line with envir-onmental improve-ments

Issue G - Varied fish diversity and numbers throughout catchment				Significance - High
Cause - i) poor underlying surface water quality ii) low flows/inconsistency of flow in some watercourses				
Actions	**Responsible parties**	**Benefits**	**Implications**	**Timescale**
1. As Issues F	Issue F	Progressive improvements in water quality, to allow achievement of fishery potential Improvements in fishery resource would provide conditions suitable for successful angling	Issue F	Issue F
2. Improvements to physical habitat, through introduction of in-channel features	NRA Fishery Owners	As above	Cost to NRA and fishery owners	In-line with pro-gressive water quality improve-ments
3. Re-introduction of suitable fish species to improved reaches	NRA	As above	Cost of fish rearing	Pending improved water quality

Issue H - Environmental conditions unsuitable for recreational activities				Significance - Medium
Cause i) poor underlying surface water quality ii) low/inconsistent flows in some watercourses iii) limited access to reaches in urban areas				
Actions	Responsible parties	Benefits	Implications	Timescale
1. As Issues A to E	Issues A to E	Improvements in water quality and river flow would provide conditions more suitable for recreational purposes	Issues A to E	Issues A to E
2. Promote improved access with Local Authorities (see also Issue K.3)	NRA Local Authorities Local sports clubs	Improved access for recreational purposes	Cost to responsible parties	On-going

Issue I - Potential flooding in Kidderminster				Significance - High
Cause - increased run-off and development pressures				
Actions	Responsible parties	Benefits	Implications	Timescale
1. Improvement scheme, pending redevelopment of riparian land	Landowner/developer NRA	Reduces risk of flooding and potential damage industrial and commercial properties	Capital cost to NRA and developer	Medium term - subject to site re development
		Reduced maintenance costs	Increased flow through Kidderminster could top erosion of downstream channel	
2. Provision of flood forecasting system	NRA	Able to warn riparian owners of imminent flooding	Cost to NRA	On-going

Issue J - Periodic flooding of Wolverhampton racecourse and properties in Aldersley area				Significance - High
Cause - Increased peak-rate flow, due to improvements in surface water drainage system in Wolverhampton				
Actions	Responsible parties	Benefits	Implications	Timescale
1. Increase channel capacity of the Smestow Brook by either -	Wolverhampton MBC STW Ltd NRA	Reduces flooding problem	Cost to responsible authorities Increased drainage may lead to erosion of downstream channel during flood flows	
a) construction of a by-pass culvert			Water quality implications must be considered	Medium term
OR				
b) instream channel improvements			Disruption to aesthetic/ conservation value of linear park	Medium term

Issue K - Periodic flooding of specific locations - see Map 22	Significance - Medium

Cause - i) alteration of flow regimes due to urbanisation
ii) inadequate maintenance due to poor access
iii) high levels of water-borne debris

Actions	Responsible parties	Benefits	Implications	Timescale
1. Restore flow to natural regime through source control and surface water balancing	Local Authorities Landowner/developer NRA	Reduces flooding problems and damage to riparian property	Cost to developers Increased risk of erosion of channel downstream during peak flows	On-going
2. Improve watercourses to increase capacity	As above			On-going
3. Improve access through liaison with land-owners and Local Authorities	As above	Reduces maintenance costs		On-going
4. Encourage environmental awareness to reduce waterborne debris	As above	Reduces maintenance cost Improves aesthetic and conservation value	Publicity cost to NRA Cost to landowner	On-going
5. Provision of flood forecasting system	NRA	Able to warn riparian owners of imminent flooding, where possible	Cost to NRA	On-going

Appendix 1 Model Policies for Use in Development Plans

The NRA has a wide range of direct powers to prevent and control water related problems, and where appropriate will use them. However, these are not always adequate to protect against all of the potential problems surrounding development, and rarely offer preventative measures. Many of these measures are material to Town and Country Planning and it is for this reason that the NRA is involved in the planning process. When consulted on Draft Plans the NRA will comment on issues related to specific sites but for the process to be fully effective it is important that policies which cover NRA interests are incorporated in Development Plans. Model policies have been prepared, as set out below, but it is appreciated that to meet individual Plan styles the exact format may need to be modified.

Flood Defence

Policy 1

The Council recognises the importance of the natural watercourse system for providing essential drainage of land and will protect that function against adverse forms of development, specifically to prevent:-

(i) Development in area liable to flooding.

(ii) The loss of access to watercourses for future maintenance.

(iii) The loss of natural flood plain except in exceptional circumstances and where compensatory measures are provided as agreed with the local planning authority.

(iv) Drainage from development giving rise to substantial changes in the characteristics of surface water run-off unless adequate off site works can be provided.

(v) Adverse affects upon the integrity of tidal and fluvial defences.

These policies are necessary to ensure new development is itself not at risk from flooding and also does not put other areas at risk, endangering both life and property. Flood plains and areas of low lying land adjacent to a watercourse are by their very nature liable to flood under certain conditions. These areas also provide for storage of flood water and consequently not only are people and property at risk but development also reduces the capacity of the flood plain, impedes the flow of water and increases the risk of flooding elsewhere. Development in upper parts of a catchment can also have a significant impact upon others downstream by increasing surface run-off. An obligation to provide suitable mitigating measures is therefore necessary where this applies. A guarantee of future access to watercourses is required. However, the NRA's own powers under Land Drainage legislation extend only to designated main rivers and, even where these exist, are in practical terms very limited when development has proceeded in accordance with local plan policy.

Registered Contaminated Land

Policy 2

The Council will only allow development on registered contaminated land where it can be demonstrated that it will not cause or increase pollution of watercourses and groundwater resources.

The disturbance of contaminated land can mobilise pollutants and either cause first time pollution or worsen existing problems. Leachates and drainage from contaminated land sites pose serious risks of major pollution to both rivers and groundwaters.

Groundwater Protection

Policy 3

The Council will have regard to the NRA's "Policy and Practice for the Protection of Groundwater" and will not allow development which could damage groundwater resources and prevent use of those resources.

Groundwater resources are a vital component of the potable water supplies but once polluted the damage is invariably irrevocable. It is essential therefore that development which threatens these resources is prevented.

Water Pollution Prevention

Policy 4

The Council recognises the importance of maintaining the quality of the water based environment and will not permit development which could damage the quality and ecology of watercourses, or compromise statutory quality objectives. The Council will ensure that all development is served by satisfactory arrangements for disposal of foul sewage, trade effluent and surface water, and specifically:-

(i) For the development sites where connection to existing main sewerage is practicable, the Council will oppose any development incorporating independent sewage treatment facilities, and

(ii) The Council will seek to promote and co-ordinate public sewage disposal facilities or require developers to demonstrate that the multiple use of individual facilities such as septic tanks is feasible without causing a public health nuisance and possible water pollution especially where there is a potential for high density infill.

(iii) The Council will ensure that where increased sewerage and/or sewage treatment capacity if required development will not be allowed to be occupied in advance of the completion of the improved facilities.

(iv) The Council will ensure that no development involving the storage of oils and chemicals shall take place unless adequate measures have been taken to prevent discharge to watercourses in the event of spillages and/or leaks.

These policies seek to ensure the most environmentally effective means of disposal of foul sewage, contaminated surface water and trade effluents is used for any development. The Authority would wherever possible wish to see sewage and trade effluents disposed of via a recognised water reclamation facility where capacity exists. Alternatively the Council could promote the necessary infrastructure, together with the utilities companies, where there would otherwise be multiple use of small treatment plants. It is often in practical terms difficult to guarantee a consistent quality of effluent from small privately operated treatment plants and the problems are often then compounded by having many units in close proximity giving rise to environmental health nuisance as well as potential water pollution problems.

With increasing population and water use sewerage systems and treatment works become overloaded. Where development is allowed to continue despite overloading, pollution of watercourses will occur. The Authority has powers to control the standards of effluent from treatment works, with the ultimate sanction of prosecution. However, this may be too late to prevent damage and a reasonable approach would be to phase development to coincide with increased treatment capacity.

Equally, there are circumstances where development cannot be achieved without detriment to quality or ecology and the Authority will seek refusal of planning consent on principle in such cases.

Water Environment

Policy 5

The Council recognises the importance of the natural watercourse system and wetland areas as valuable wildlife habitats and for their amenity interests and will:-

(i) protect those interests against adverse forms of development and

(ii) encourage the development of water based recreation and public access whenever appropriate and where it will not conflict with the ecological value of the area.

The Water Resources Act 1991 (Section 16) places upon the Authority a duty not only to further the conservation of landscape, flora, fauna and geological features but also to take measures to enhance it as far as any of its functions are concerned. It also has duties to promote recreation and to have regard to the conservation of historic and archaeological features. Clearly, developments can severely threaten these interests.

Water Resources

Policy 6

The Council will not allow development to proceed prior to the availability of the necessary water resources, the use of which has no detrimental effect on the environment.

The development of water resources for public water supply is becoming increasingly difficult in some areas. The Authority has a duty to ensure that providing water for new development does not have a detrimental impact on existing users, nature conservation or recreation.

Appendix 2: Treated sewage discharges and industrial discharges

No	Treated Sewage Discharges	Existing Consent BOD:SS:NH3	Volume **	Mean Daily Results for 1991 BOD load (kg/d)	SS load (kg/d)	NH3 load (Kg/d)	Volume Ml/d
1	Roundhill STW	30:45:15	34	696	843	153	43
2	Barnhurst STW	20:25:10	28	133	133	35	27
3	Kidderminster STW	35:45:15	24	370	615	65	26
4	Freehold STW	25:45 -	19	86	62	206	16
5	Lower Gornal STW	25:45 -	8.5	78	87	25	7.6
6	Trescott STW	25:50 -	6.5	62	86	20	6.3
7	Caledonia STW	30:45:10	7.9	59	87	8	6.0
8	Wombourne STW	30:40 -	3.8	48	34	28	3.7
9	Kinver STW	25:45 -	1.8	20	36	3	2.8
10	Gospel End STW	25:45	2.9	24	23	2	2.3
11	Hagley STW	30:40 -	1.1	25	30	10	1.2
12	Belbroughton STW	30.45 -	0.42	4	8	0.5	0.41
13	Blakedown STW	30:40 -	0.37	5	6	1	0.36
14	Himley STW	20:30:10	0.06	0.8	2	0.3	0.06
15	Enville STW	40:60 -	0.05	0.6	0.8	0.2	0.04
16	Lower Penn STW	25:45 -	0.05	0.2	0.4	0.1	0.04
17	Himley Hall STW	Descriptive	-	-	-	-	0.007
18	Dimminsdale STW	Descriptive	-	-	-	-	0.004
	Private STWs	-	-	7	2	6	-
	Industrial Discharges						
1.	Everest Frozen Foods Ltd	25:45 -	0.54	4	15	2	0.27
2	Russel Hobbs Tower Ltd	20:25 -	0.33	0.9	2	0	0.08
	Other Indsutrial Discharges *	-	-	5.9	45	0.2	-

* Non rainfall dependnt discharges only

** Maximum volume under dry weather conditions

Appendix 3 River Quality Objective (RQO) Standards

River Class	Quality Criteria	Remarks	Current potential uses
1A	Class limiting criteria (95 percentile) (i) Dissolved oxygen saturation greater than 80%. (ii) Biochemical oxygen demand not greater than 3mg/l. (iii) Ammonia not greater than 0.4mg/l. (iv) Where the water is abstracted for drinking water, it complies with requirements for A2** water. (v) Non-toxic to fish in EIFAC terms (or best estimates if EIFAC figures not available).	(i) Average BOD probably not greater than 1.5mg/l. (ii) Visible evidence of pollution should be absent.	(i) Water of high quality suitable for potable supply abstractions and for all other abstractions. (ii) Game or other high class fisheries. (iii) High amenity value.
1B	(i) DO greater than 60% saturation (ii) BOD not greater than 5mg/l (iii) Ammonia not greater than 0.9mg/l (iv) Where water is abstracted for drinking water, it complies with the requirements for A2** water. (v) Non-toxic to fish in EIFAC terms (or best estimates if EIFAC figures not available).	(i) Average BOD probably not greater than 2mg/l. (ii) Average ammonia probably not greater than 0.5mg/l. (iii) Visible evidence of pollution should be absent. (iv) Waters of high quality which cannot be placed in Class 1A because of high proportion of high quality effluent present or because of the effect of physical factors such as canalisation, low gradient or eutrophication. (v) Class 1A and Class 1B together are essentially the Class 1 of the River Pollution Survey (RPS).	Water of less high quality than Class 1A but usable for substantially the same purposes.
2	(i) DO greater than 40% saturation. (ii) BOD not greater than 9mg/l. (iii) Where water is abstracted for drinking water, it complies with the requirements for A3** water. (iv) Non-toxic to fish in EIFAC terms (or best estimates if EIFAC figures not available).	(i) Average BOD probably not greater than 5mg/l. (ii) Similar to Class 2 of RPS. (iii) Water not showing physical signs of pollution other than humic colouration and a little foaming below weirs.	(i) Waters suitable for potable supply after advanced treatment. (ii) Supporting reasonably good coarse fisheries. (iii) Moderate amenity value.

3	(i) DO greater than 10% saturation. (ii) Not likely to be anaerobic. (iii) BOD not greater than 17mg/l*.	Similar to Class 3 of RPS.	Waters which are polluted to an extent that fish are absent or only sporadically present. May be used for low grade industrial abstraction purposes. Considerable potential for further use if cleaned up.
4	Waters which are inferior to Class 3 in terms of dissolved oxygen and likely to be anaerobic at times.	Similar to Class 4 of RPS.	Waters which are grossly polluted and are likely to cause nuisance.
X	DO greater than 10% saturation.		Insignificant watercourses and ditches not usable, where objective is simply to prevent nuisance developing.

Notes

(a) Under extreme weather conditions (eg flood, drought, freeze up), or when dominated by plant growth, or by aquatic plant decay, rivers usually in Classes 1, 2 and 3 may have BODs and dissolved oxygen levels, or ammonia content outside the stated levels for those Classes. When this occurs the cause should be stated along with analytical results.

(b) The BOD determinations refer to 5 day carbonaceous BOD (ATU). Ammonia figures are expressed as NH_4.

(c) In most instances the chemical classification given above will be suitable. However the basis of the classification is restricted to a finite number of chemical determinands and there may be a few cases where the presence of a chemical substance other than those used in the classification markedly reduces the quality of the water. In such cases, the quality classification of the water should be downgraded on the basis of the biota actually present, and the reasons stated.

(d) EIFAC (European Inland Fisheries Advisory Commission) limits should be expressed as 95% percentile limits.

* This may not apply if there is a high degree of re-aeration.

** EEC category A2 and A3 requirements are those specified in the EEC Council Directive of 16 June 1975 concerning the Quality of Surface Water intended for Abstraction of Drinking Water in the Member States.

Appendix 4 Standards of Service for Flood Defence and Land Drainage

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

NRA

National Rivers Authority
Severn-Trent Region