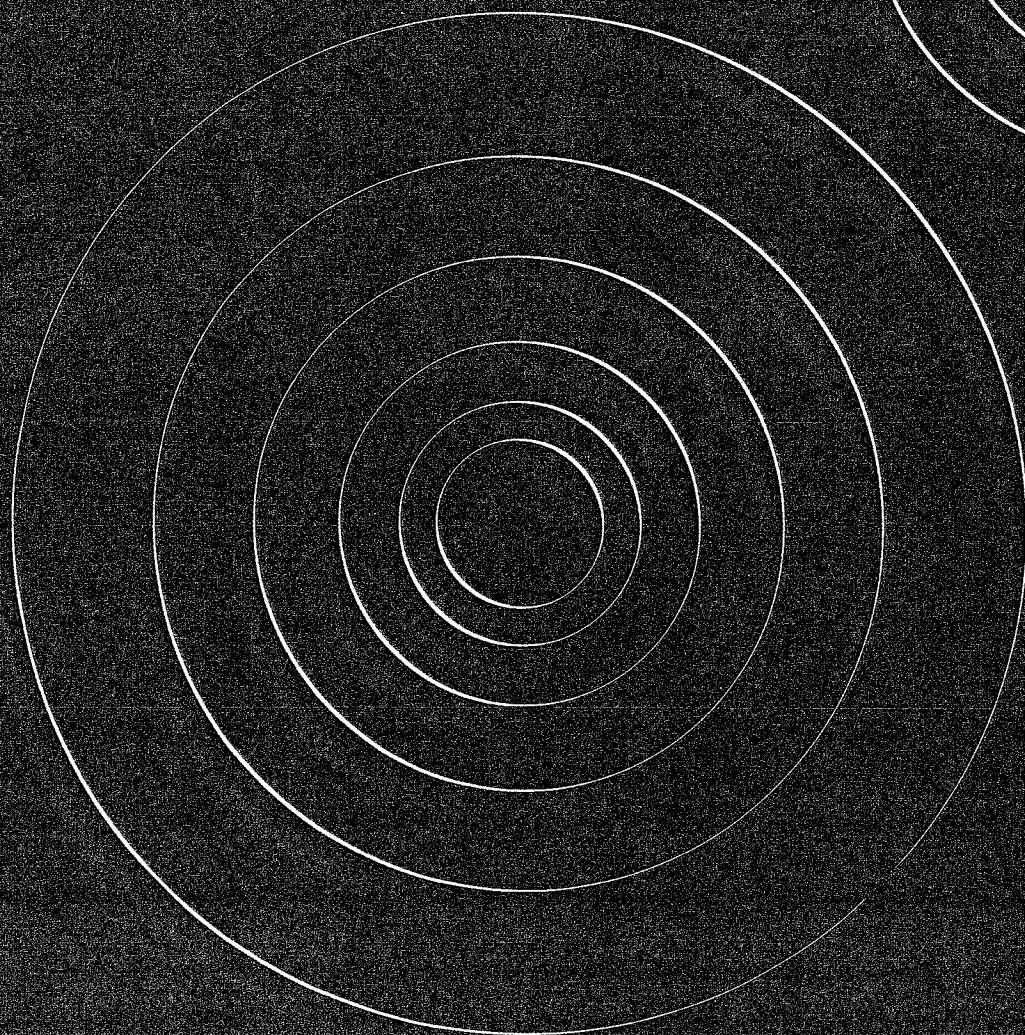
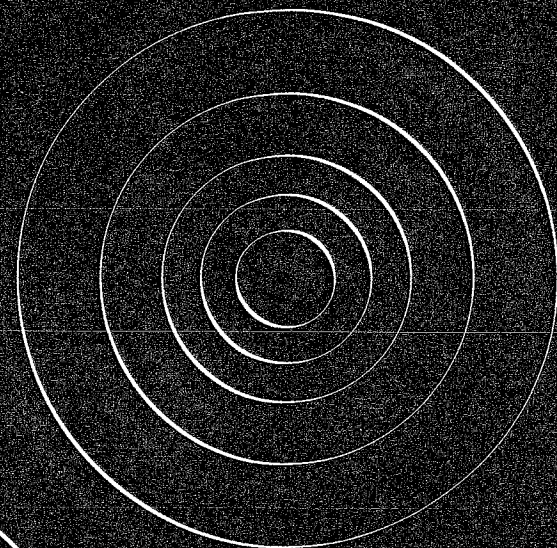


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For detailed information on WS Atkins Water, call or write to:

Tim Gross
Managing Director
WS Atkins Water
Woodcote Grove, Ashley Road
Epsom, Surrey KT18 5BW
Tel: (01372) 726140; Fax: (01372) 740055.
E-mail: wsatkinsinfo@wsatkins.co.uk
Website: www.wsatkins.co.uk



Total solutions, total commitment

foreword

Water UK is the trade body of the UK water industry. It exists to represent members' interests and aspires, amongst other things, to be a centre of excellence for information about the industry.

Waterfacts is the only report of its kind and is the established annual directory of facts and figures about the water industry. It provides a reliable and consistent resource document for people working with and within water operators and associated industries, politicians, academics and anyone with an interest in the water industry.

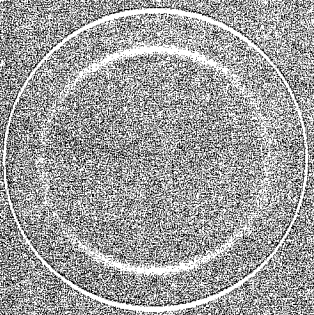
We aim to make Waterfacts useful, practical, accessible and relevant. It is designed with this in mind and we would welcome your feedback about how we can continue to improve it for you in the future.

Pamela Taylor

Chief Executive Water UK

- 1 water services in the UK
- 2 regulation of water services
- 3 water supply
- 4 sewage and sewage sludge
- 5 paying for water services
- 6 finance and investment
- 7 staffing
- 8 international
- 9 other water organisations
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water services in the UK



Water is one of the most basic essentials for life on Planet Earth – yet it is often the thing we take most for granted. In this country society in its present form exists because of the hugely developed water collection and distribution systems, which provide us with pure, safe drinking water 24 hours a day and remove our waste products while protecting us from health risks and disease. Modern water and sewerage systems have played vital roles in reducing disease in society. Only just over 100 years ago, outbreaks of waterborne cholera were still common in the UK.

Water is also a major force in the shaping of our planet: along with wind and ice, it is one of the main agents for eroding rock. Over millions of years, water can carve valleys, create river floodplains and cliffs, lay down vast areas of sediment which, in time, become rocks themselves. The USA's Grand Canyon – one of the most staggering geographical features in the world – was created by water in the shape of the Colorado River.

Our weather patterns are also driven by water – particularly temperature changes in the oceans. It is the warming and cooling of tropical seas which provide power to convection currents in our atmosphere, thus creating winds and storms. The violent El Niño event of 1997-98 – a series of storms, monsoons and droughts affecting the Pacific rim countries – was caused by a vast current of cold water reaching out across the Pacific from Australia to South America. This cold water event – Niño which occurs on a cycle of every 3-5 years – affected weather patterns throughout the tropics and, some would argue, the world.

In the UK, our water and waste water industry delivers services universally recognised as essential to the health and economic wellbeing of society as a whole.

The statistics are impressive: the industry supplies services to more than 20 million properties – the vast majority of the UK's population; it has a turnover of more than £7 billion a year; assets which include nearly 1,000 reservoirs, over 2,500 water treatment works, and 9,000 sewage treatments works. More than 700,000 kilometres of mains and sewers are buried beneath the ground— that's enough to stretch to the moon and back, or a distance 200 times greater than the UK's entire motorway network.

Generally speaking, the water industry in this country is financially and operationally far bigger than most people recognise. It invests more than £3.8 billion a year, and employs directly more than 44,000 people while indirectly providing jobs to even more in activities as diverse as construction, environmental consultancy, plant engineering and information technology.

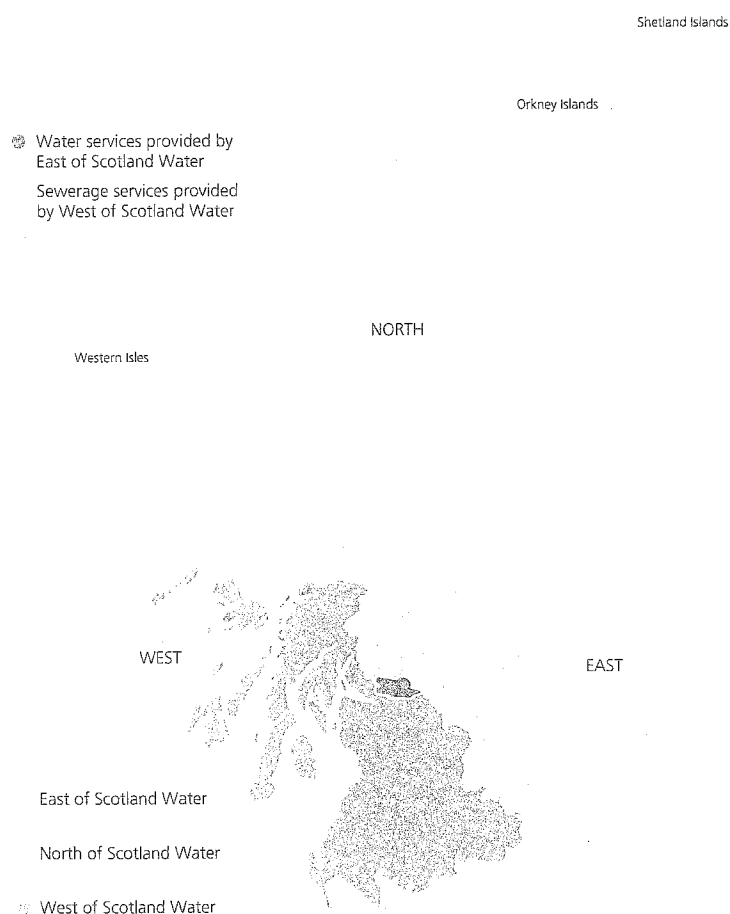
The industry's history is a complex one. Today, its organisation varies in different parts of the United Kingdom for a host of geographical, social and political reasons.

In Scotland, three public-owned water authorities provide services: North of Scotland Water, East of Scotland Water and West of Scotland Water. They took over on 1 April 1996, replacing an older system under which water and sewerage services were provided by nine regional councils and three island councils. The Water Industry Act 1999 provides for a Water Industry Commissioner for Scotland to be a professional regulator of the water authorities, responsible for regulating all aspects of their economic and customer service performance. Its provisions reflect the fact that the authorities, unlike most other utilities in the UK, remain in the public sector.

In Northern Ireland, services are provided by a public sector organisation, the Northern Ireland Water Service, A Next Steps Agency of the Department for Regional Development which was given responsibility for water and sewerage at local government reorganisation in 1996. A consultation paper about possible changes to the organisation of the Water Service in Northern Ireland was issued for comment at the beginning of 1999. Any decision will be taken by the Northern Ireland Assembly.

In England and Wales, water services are provided by the private sector. Ten privatised companies provide both water and sewerage services while 16 water supply companies provide drinking water to their customers. The water service companies were created in 1989 by the privatisation of ten public-owned water authorities. The water supply companies have always been in the private sector – many date back to the Victorian era.

1.1 Scottish Water Authorities



WATER IN SCOTLAND

Scottish Office, Agriculture, Environment and Fisheries Department, Environmental Affairs Group,
Water Services Unit, Victoria Quay, Edinburgh EH6 6QQ
Tel: 0131 244 0248 Fax: 0131 244 0259

East of Scotland Water
Pentland Gait, 597 Calder Road, Edinburgh EH11 4HJ
Tel: 0131 453 7500 Fax: 0131 453 7558

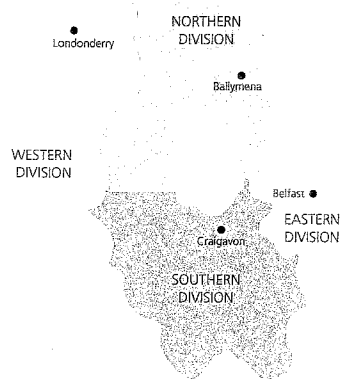
West of Scotland Water
419 Balmore Road, Glasgow G22 6NU
Tel: 0141 355 5333 Fax: 0141 355 5146

North of Scotland Water
Cairngorm House, Beechwood Business Park,
Inverness IV2 3ED
Tel: 01463 245400 Fax: 01463 245405

The three Scottish Water Authorities were established in June 1995 under the Local Government etc. (Scotland) Act 1994 and took over responsibility for water and sewerage services on 1 April 1996. Each Authority has a board of 12 members, including the Chairman and Chief Executive. The authorities were established as public corporations, within the public sector and operating on a trading basis, with individual areas of responsibility in the north, east and west of the country.

The authorities' role is to provide an efficient and cost effective delivery of water and sewerage services, which meet water quality and environmental standards. They are encouraged to seek private finance for capital investment under the terms of the Public & Private Partnership (PPP).

1.2 the Northern Ireland Water Service



WATER IN NORTHERN IRELAND

Water Service,
3 Frederick Street, Belfast, BT1 2NR
Tel: 01232 244711 Fax: 01232 354888

The Water Service consists of a Head Office Group and four territorial operational Divisions, under the control of the Water Service Board.

The Northern Ireland Water Service is a Next Steps Agency within the province's Department for Regional Development. The agency role enables it to operate as a business-focused unit within a framework of efficiency targets and performance measures designed to develop its commercial orientation.

The structure of the service has been the subject of a Government consultation exercise. The decision on its future will be taken by the Northern Ireland Assembly.

WATER IN ENGLAND AND WALES

In England and Wales, all services are provided by the private sector.

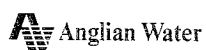
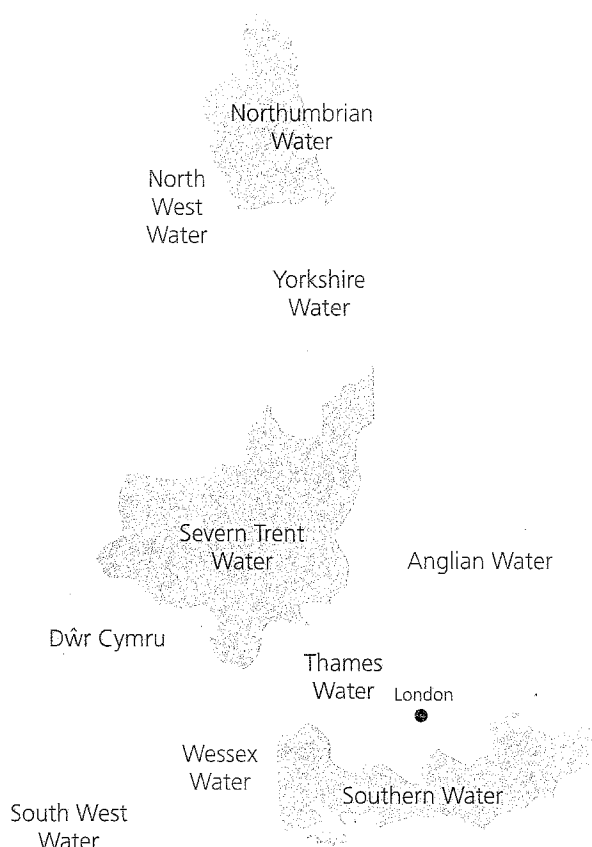
Ten water service companies, created in 1989 by the privatisation of the publicly-owned water authorities, provide sewerage services to all their customers in their areas and water to many of them. Other customers receive their water from a water supply company.

Although the 29 water supply companies were already in the private sector – and had been since Victorian times – their regulation changed substantially at the time of privatisation as they came under the same system as the 10 newly privatised regional water and sewerage companies. Since privatisation mergers and take-overs have reduced the number of water supply companies to 16. (see page 8)

The ten water services companies created at privatisation are all owned by parent companies. These parent companies may be foreign-owned – for example AZURIX, an American company, has recently purchased Wessex Water – and they may own a number of different utilities. Hyder plc, a Welsh parent company, owns both Dŵr Cymru Welsh Water and SWALEC (South Wales Electricity). Hyder is therefore referred to as a multi-utility.

In some cases, the water company and the parent company may have very similar names. Thames Water Utilities, the company which supplies water in the UK, is owned by Thames Water plc. Thames Water plc also owns Thames Water International, the part of the group which does business in overseas markets. All these companies are part of the Thames group, but only Thames Water Utilities is regulated (see Chapter 2) and is a monopoly. All other parts of the group compete in an open market.

1.3 water service companies



Anglian Water
Services Limited
Anglian House
Ambury Road
Huntingdon
PE18 6NZ
Tel 01480 323000
Fax 01480 323115



Dŵr Cymru
Welsh Water
Plas-y-Flynnon
Cambrian Way
Brecon
LD3 7HP
Tel 01874 623181
Fax 01874 624167



Northumbrian
Water Limited
Abbey Road
Pity Me
Durham
DH1 5FJ
Tel 0191 383 2222
Fax 0191 384 1920



North West
Water Limited
Dawson House
Great Sankey
Warrington
WA5 3LW
Tel 01925 234000
Fax 01925 233360



Severn Trent
Water Limited
2297 Coventry Road
Birmingham
B26 3PU
Tel 0121 722 4000
Fax 0121 722 4800



Southern Water
Services Limited
Southern House
Yeoman Road
Worthing
BN13 3NX
Tel 01903 264444
Fax 01903 262185



South West Water
Limited
Peninsula House
Rydon Lane
Exeter
EX2 7HR
Tel 01392 446688
Fax 01392 434966



Thames Water
Utilities Limited
Gainsborough House
Manor Farm Road
Reading
RG2 0JN
Tel 0845 9200 800
Fax 01793 420711



Wessex Water
Services Limited
Wessex House
Passage Street
Bristol
BS2 0JQ
Tel 0117 929 0611
Fax 0117 929 3137



Yorkshire Water
Services Limited
Western House
Western Way
Halifax Road
Bradford
BD6 2LZ
Tel 01274 691111
Fax 01274 604764

1.6 number of connections '98/99

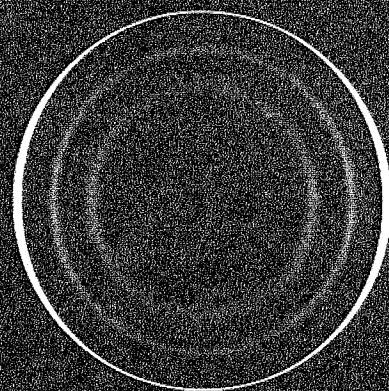
	UNMEASURED SUPPLY				MEASURED SUPPLY			
	households		non-households		households		non-households	
	water 000s	sewerage 000s	water 000s	sewerage 000s	water 000s	sewerage 000s	water 000s	sewerage 000s
TOTAL UK	20,334	19,652	437	452	2,922	2,768	1,433	1,068
Water service companies								
Anglian	982	1,401	13	19	602	727	97	98
Dŵr Cymru	1,052	1,093	22	19	66	73	80	52
Northumbrian	969	1,006	22	26	34	32	42	36
North West	2,479	2,464	24	25	219	208	187	159
Severn Trent	2,452	2,787	25	41	433	443	196	197
Southern	749	1,372	17	26	140	219	50	70
South West	495	454	7	8	111	102	64	39
Thames	2,664	4,198	30	55	377	547	163	218
Wessex	367	801	10	20	82	130	43	58
Yorkshire	1,461	1,555	21	24	280	287	118	100
Total water service cos	13,670	17,131	191	263	2,344	2,768	1,040	1,027
Water supply companies								
Bournemouth & West Hampshire	138		2		25		13	
Bristol	371		14		50		27	
Cambridge	73		1		31		8	
Cholderton	n/a		n/a		n/a		n/a	
Dee Valley Water	84		1		16		7	
Essex & Suffolk	558		5		111		37	
Folkestone & Dover	47		1		16		4	
Hartlepool	36		1		1		1	
Mid Kent	177		2		27		20	
North Surrey	157		2		28		8	
Portsmouth	259		3		2		14	
South East	426		5		96		31	
South Staffordshire	442		12		39		17	
Sutton & East Surrey	221		3		22		13	
Tendring Hundred	44		1		17		4	
Three Valleys	834		12		97		44	
York	70		2		1		4	
Total water supply cos	3,937		66		578		252	
TOTAL England & Wales	17,607	17,131	257	263	2,922	2,768	1,292	1,027
East of Scotland	690	640	55*	54*	n/a	n/a	16	n/a
North of Scotland	497	450	24	44	0	0	22	0
West of Scotland	900	900	43	43	0	0	40	40
Northern Ireland	640	531	58	48	0	0	63	1

Note: These figures do not include connections that are void, eg, empty houses.

n/a = not available

* = estimates

regulation of water services



Because of its importance to the country, its impact on people's health and the environment, and because it retains a domestic sector monopoly, the UK water industry is the most heavily regulated of all the utilities.

Regulation can be defined as a system under which an industry's activities are controlled by Government or Government-appointed organisations.

Broadly speaking, three key aspects of the UK water industry are regulated:

- Finance and economics
- Environmental impact
- Drinking water quality

FINANCIAL AND ECONOMIC REGULATION

Because water companies and authorities do not have to compete with each other for domestic customers and are subject to only limited industrial competition, the prices they charge customers are regulated. (It is worth noting, however, that the Government is proposing to introduce a duty for Ofwat to "promote" competition in the industry.)

In England and Wales, the Office of Water Services (Ofwat) has the duty to protect customers' interests while ensuring that the privately-owned water companies carry out and finance their functions properly.

Ofwat is responsible for carrying out a periodic review or assessment of prices. In practice these reviews take place every five years so far, in 1994 and 1999. The review is used to set price limits on customers' water and sewage bills for the following five years.

In Scotland, the Water and Sewerage Customers Council (SWSCC) was established on 1 April 1996 to oversee, with the Scotland (then Scottish) Office, performance of the three water authorities, their charging policy and service standards. It also investigated customer complaints. Under the Water Industry Act 1999 the SWSCC was replaced by a new Water Commissioner, who was appointed with effect from 1 November 1999.

In Northern Ireland, no separate economic regulator exists as Government provides water and sewerage services which are funded out of regional taxes (rates). The Northern Ireland Water Service is an Agency within the Department for Regional Development.

ENVIRONMENTAL REGULATION

The water industry has a huge impact on the environment - and is dependent on it. The industry abstracts or takes water from rivers, reservoirs or underground rocks; treats it and pumps it to customers. It then collects the waste water, cleans it and discharges it back into rivers and seas.

As the Northern Ireland Water Service is still part of Government, its environmental impact is monitored by the Environment and Heritage Service, part of the Department of the Environment.

The Scottish Environment Protection Agency has the duties to control discharges to rivers and seas, conserve water resources, prevent pollution and promote conservation. It was founded on 1 April 1996 - the same date as the three publicly-owned Scottish water authorities were created. SEPA does not have the power to prosecute but refers cases to the procurator-fiscal to decide if a prosecution is in the public interest.

The Environment Agency (EA) was also created on 1 April 1996 and protects the environment in England and Wales. Its powers and duties are very similar to SEPA's with the exception that the EA can take its own prosecutions.

WATER QUALITY REGULATION

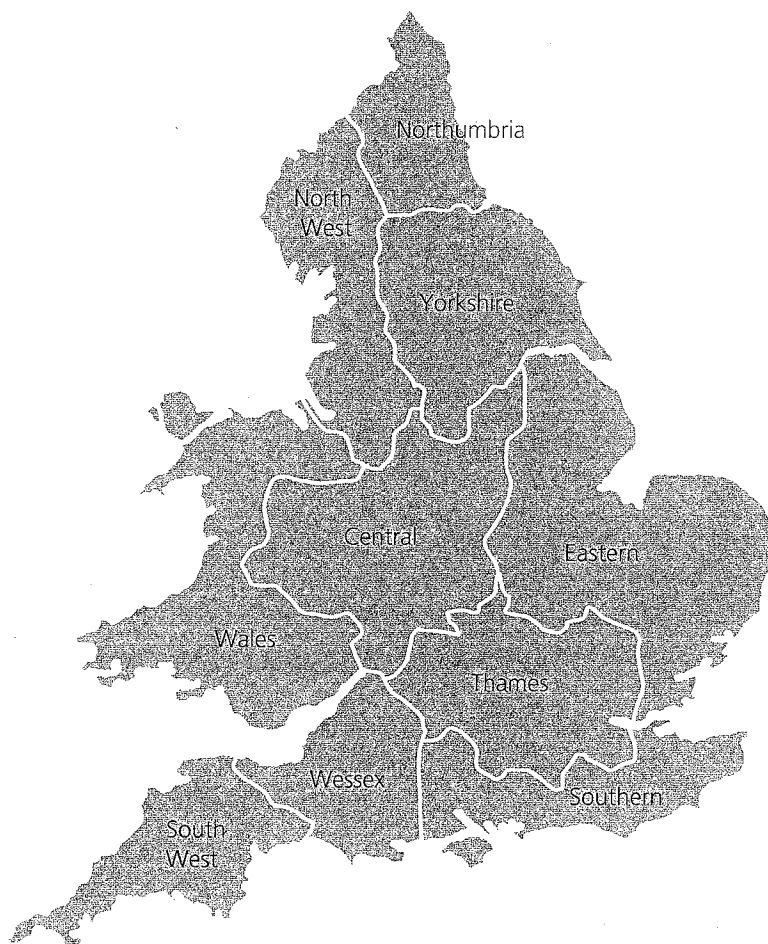
Checking the quality and safety of the UK's tap water is of supreme importance. While the water industry carries out thousands of its own tests every day, it is regulated by several different organisations.

In both Scotland and Northern Ireland, water quality is the responsibility of Government in the shape of the Scottish Executive and the Northern Ireland Department of the Environment.

England and Wales has an independent Government-appointed regulator: the Drinking Water Inspectorate. The Inspectorate sets standards and maximum levels for the various chemicals in drinking water and can prosecute companies that fail to meet them. It conducts an annual review and produces an annual report on drinking water quality.

2.1 Ofwat Customer Service Committees (CSCs)

Ofwat
Office of Water Services
 Centre City Tower
 7 Hill Street
 Birmingham
 B5 4UA
 Tel: 0121 625 1300
 Fax: 0121 625 1400



Central CSC
 Will Dawson
 1st Floor
 Channele House
 86 New Street Birmingham
 B2 4BA
 Tel: 0121 644 5252
 Fax: 0121 644 5256

CSC for Wales
 Clive Sterl
 Room 140
 Caradog House
 1-6 St Andrews Place
 Cardiff CF1 3BE
 Tel: 01222 239852
 Fax: 01222 239847

Eastern CSC
 Marisa Johnson
 Ground Floor
 Carlyle House
 Carlyle Road
 Cambridge CB4 3DN
 Tel: 01223 323889
 Fax: 01223 323930

Northumbria CSC
 Liz Bond
 Eighth Floor
 Northgate House
 St Augustine's Way
 Darlington DL1 1XA
 Tel: 01325 464 222
 Fax: 01325 369 269

North West CSC
 Margaret Smith
 Suite 902
 9th Floor
 Bridgewater House
 Whitworth Street
 Manchester M1 6LT
 Tel: 0161 236 6112
 Fax: 0161 228 6117

Southern CSC
 Karen Gibbs
 3rd Floor
 15-17 Ridgmount Street
 London WC1E 7AH
 Tel: 0171 636 3656
 Fax: 0171 637 4813

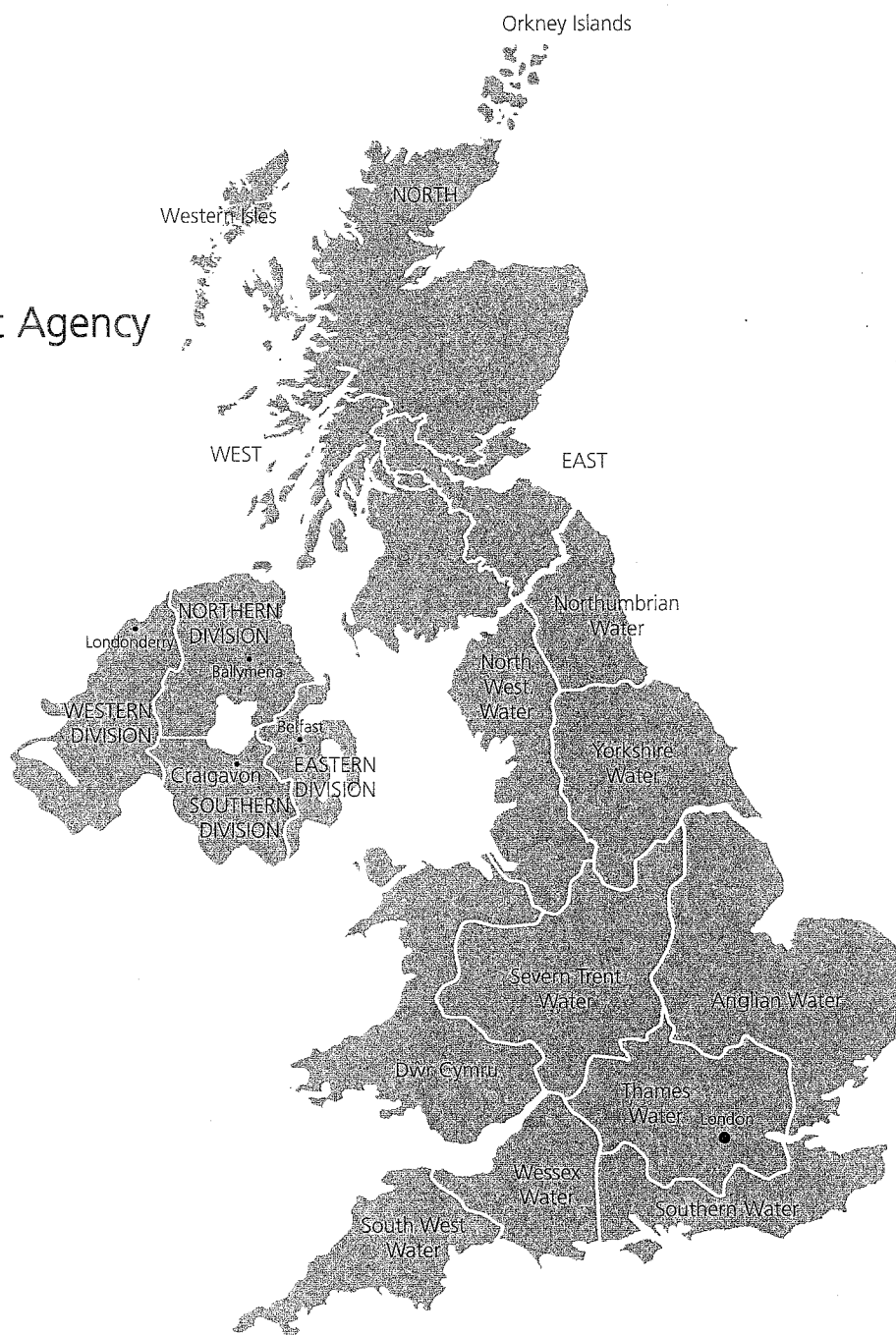
South West CSC
 Gillian Johnston
 1st Floor
 Broadwalk House
 Southernhay West
 Exeter EX1 1TS
 Tel: 01392 428028
 Fax: 01392 428010

Thames CSC
 Andrew Milne
 2nd Floor
 15-17 Ridgmount Street
 London WC1E 7AH
 Tel: 0171 636 3656
 Fax: 0171 636 3665

Wessex CSC
 Teresa Evans
 2 The Hide Market
 West Street
 St Philips
 Bristol BS2 0BH
 Tel: 0117 955 7001
 Fax: 0117 955 7037

Yorkshire CSC
 John Tushingham
 Eighth Floor
 Northgate House
 St Augustine's Way
 Darlington DL1 1XA
 Tel: 01325 469 777
 Fax: 01325 369 269

2.2 Environment Agency regional offices



Head Office: Bristol
 Rio House
 Waterside Drive
 Aztec West
 Almondsbury
 Bristol BS32 4UD
 Tel: 01454 624400
 Fax: 01454 624409

Anglian
 Kingfisher House
 Goldhay Way
 Orton Goldhay
 Peterborough
 PE2 5ZR
 Tel: 01733 371811
 Fax: 01733 231840

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

Southern
 Guildbourne House
 Chatsworth Road
 Worthing
 West Sussex
 BN11 1LD
 Tel: 01903 832000
 Fax: 01903 821832

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

Scotland
 Scottish Environment
 Protection Agency
 SEPA Head Office
 Erskine Court
 Castle Business Park
 Stirling FK9 4TR
 Tel: 01786 457 700
 Fax: 0186 446 885

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

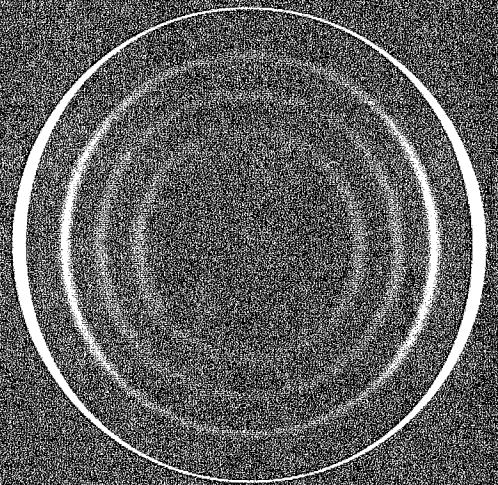
North West
 Richard Fairclough House
 Knutsford Road
 Warrington
 WA4 1HG
 Tel: 01925 653999
 Fax: 01925 415961

South West
 Manley House
 Kestrel Way
 Exeter EX2 7LQ
 Tel: 01392 444000
 Fax: 01392 444238

Welsh
 Rivers House
 Plas-yr-Afon
 St Mellons Business Park
 Cardiff CF3 0LT
 Tel: 01222 770088
 Fax: 01222 798555

Northern Ireland
 Department of Regional
 Development
 Water Service
 Northern Ireland
 Northland House
 3 Frederick Street
 Belfast BT1 2NR
 Tel: 01232 244 711
 Fax: 01232 354 888

water supply



3.1 total annual rainfall (mm)

	1961-90 average	1990	1991	1992	1993	1994	1995	1996	1997	1998
EA Region										
Anglian	596	472	470	705	728	646	542	472	577	713
Northumbria	853	865	806	847	965	881	815	724	832	1,039
North West	1,201	1,256	1,111	1,238	1,165	1,359	1,015	956	1,109	1,435
Severn Trent	754	687	645	848	836	859	676	621	738	885
Southern	778	699	703	801	907	946	764	644	785	875
South West	1,173	1,175	1,092	1,126	1,386	1,474	1,178	1,129	1,197	1,428
Thames	688	553	602	795	772	744	687	535	625	812
Welsh	1,313	1,301	1,219	1,390	1,370	1,563	1,208	1,153	1,273	1,642
Wessex	839	742	766	849	964	1,035	930	782	880	1,005
Yorkshire	821	777	674	837	895	887	690	696	772	954
England & Wales	895	838	790	949	983	1,023	830	755	864	1,057
Scotland	1,436	1,918	1,469	1,735	1,488	1,615	1,496	1,267	1,423	1,743
Northern Ireland	1,059	1,235	1,012	1,156	1,158	1,166	1,066	1,085	1,051	1,274

Note: to allow better spacial differentiation rainfall data are presented for the old regional divisions of the NRA - precursor of the EA. These regions differ slightly from water service company regions.

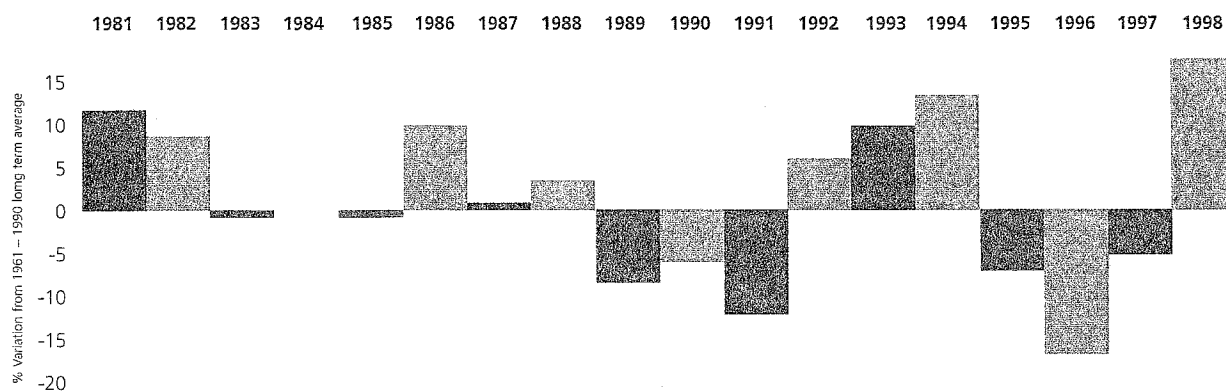
Note: subsequently Northumbria and Yorkshire have merged to become North East, South West and Wessex have merged to become South West, and Severn Trent has become Midlands.

Source: Institute of Hydrology using Meteorological Office data, DoE (NI) Water Service

Annual rainfall in England and Wales at 1057mm was in 1998 well above average and 118% of the 1961-1990 long term average. In Scotland, as well, rainfall in 1998 at 1743 mm was above average at 121% of the 1961-1990 figure.

Water operators continue their efforts to improve the efficiency of water use, including increased expenditure on leakage reduction, and many have launched further initiatives to encourage industry and domestic customers to use water more wisely.

3.2 rainfall for England and Wales '81 to '98



Source Digest of Environmental Statistics, DETR 1998

3.3 drought orders

EA Region	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98
Anglian	15	0	0	0	0	0	0	0	0	0	0	0	0	1	3	0	0	0	0	0	0	1	0
North East	18	0	0	0	0	0	0	0	0	0	0	0	0	9	17	9	1	0	0	21	18	0	0
North West	0	0	2	0	2	0	6	0	31	0	0	0	0	21	0	1	0	0	0	23	12	0	0
Midlands	13	0	0	0	0	0	0	0	6	0	0	0	0	5	0	0	0	0	0	1	2	0	0
Southern	4	0	0	0	0	0	0	0	0	0	0	0	0	19	25	18	11	0	0	1	5	2	0
South West	58	0	15	0	0	0	7	5	45	0	0	0	0	21	13	0	1	0	0	7	6	0	0
Thames	8	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	3	0	0	0	0	0	0
Welsh	20	0	2	0	2	0	2	1	22	0	0	0	0	13	1	0	0	0	0	0	2	0	0
TOTAL																							
England & Wales	136	0	19	0	4	0	15	6	104	0	0	0	0	89	61	28	16	0	0	53	45	3	0
Northern Ireland	4	3	1	0	2	0	0	9	8	0	0	0	1	4	0	0	0	0	0	10	0	0	0
Scotland	There were no drought orders in Scotland in 1997. Data for 1976-1998 is not available.																						

Note: EA regions, previously NRA regions, differ slightly from water service company regions.

Source: Digest of Environmental Statistics DETR, Welsh Office, Northern Ireland Water Service

Drought orders can restrict water abstraction and restrict non-essential uses, such as garden irrigation or car washes. The number issued generally reflects a drought's severity, as the figures for 1976, 1984, 1989-92 and 1995 and later illustrate – although no two droughts are ever the same.

The impact of the 1976 drought was widely spread across England and Wales, while the 1984 one was mostly

localised in western England. The 1988-92 drought began as a surface water drought in winter, affecting many reservoir-dependent companies, but as it progressed, it became a groundwater drought involving the east and the south of the country. The severe dry spell from 1995 to 1997 resulted in minimal numbers of drought orders and no drought orders were required in 1998.

3.4 estimated water abstractions (million litres/day) 1997

EA region	Public water supply		Private water supply		Industry		Mineral washing		Spray irrigation	
	surface	ground	surface	ground	surface	ground	surface	ground	surface	ground
Anglian	1,093	660	0	32	91	168	18	79	93	86
North East	1,754	398	53	14	570	110	2	1	4	12
North West	1,392	168	0	0	374	118	9	28	1	1
Midlands	1,653	945	2	5	326	110	14	43	29	19
Southern	407	981	0	2	48	124	1	17	13	6
South Western	861	396	16	9	100	30	2	2	3	2
Thames	2,734	1,355	3	21	19	106	0	78	5	13
Welsh	1,928	97	2	1	532	37	1	0	3	1
England & Wales	11,822	5,000	76	84	2,060	803	47	248	151	140

EA region	Agriculture*		Fish farming		Electricity supply		Other		TOTAL	
	surface	ground	surface	ground	surface	ground	surface	ground	surface	ground
Anglian	0	16	50	3	17	0	16	2	1,378	1,046
North East	0	9	465	2	93	12	198	28	3,139	586
North West	0	6	174	2	418	0	0	1	2,368	324
Midlands	1	7	64	4	1,264	9	0	0	3,353	1,142
Southern	1	7	1,032	158	0	2	34	2	1,536	1,299
South Western	5	38	1,460	128	1,362	2	1	34	3,810	641
Thames	0	6	330	25	90	0	0	0	3,181	1,604
Welsh	0	11	312	1	8,636	2	94	0	11,639	150
England & Wales	7	100	3,887	323	11,880	27	343	67	30,273	6,792

Note: EA regions, previously NRA regions, differ slightly from Water Service Company regions.
Licensing under the Water Resources Act 1991 does not apply in Scotland or Northern Ireland, therefore no comparable data is available

Source: Digest of Environmental Statistics DETR

In England and Wales, the water industry is the second biggest single abstractor of fresh water, accounting for 39% of surface abstractions and the biggest groundwater (water from underground rocks) abstractor at 74%. As DETR statistics make clear, there are other big users with

power generation the biggest accounting for over 39% of all surface water abstraction and industry generally accounting for large amounts. If abstractions from the seas are also included, the power industry becomes the single biggest abstractor.

3.5 public water supplied in 1985/86 to 1998/99 (million litres/day)

	England & Wales			TOTAL ¹	Scotland	Northern Ireland	TOTAL UK ¹
	unmeasured	measured	non-potable				
1985/86	12,036	3,965	575	16,576	2,198	678	19,452
1986/87	12,195	4,088	571	16,854	2,243	679	19,776
1987/88	12,216	4,059	604	16,879	2,194	680	19,753
1988/89	12,177	4,114	605	16,896	2,205	679	19,780
1989/90	12,424	4,135	714	17,273	2,248	674	20,195
1990/91	12,549	4,256	576	17,381	2,300	680	20,361
1991/92	12,399	4,258	552	17,209	2,239	680	20,128
1992/93	11,551	4,417	503	16,471	2,206	670	19,347
1993/94	11,999	4,034	521	16,554	2,272	670	19,496
1994/95	12,350	4,139	526	17,015	2,263	680	19,958
1995/96	12,644	4,384	293	17,321	2,247	703	20,271
1996/97	11,917	4,446	295	16,658	2,321	706	19,685
1997/98	11,182	4,511	297	15,990	2,387	690	19,067
1998/99	10,199	4,663	282	15,144	2,165	692	18,001

Note: data for public water supply for 1973/4 to 1984/5 was given in Waterfacts 1997
Some revisions have been made to figures from previous years.
¹Totals may not add due to rounding.

Source: Water companies, Scottish Office, DoE (NI) Water Service

3.6 public water supplied in 1998/99 (MI/d)

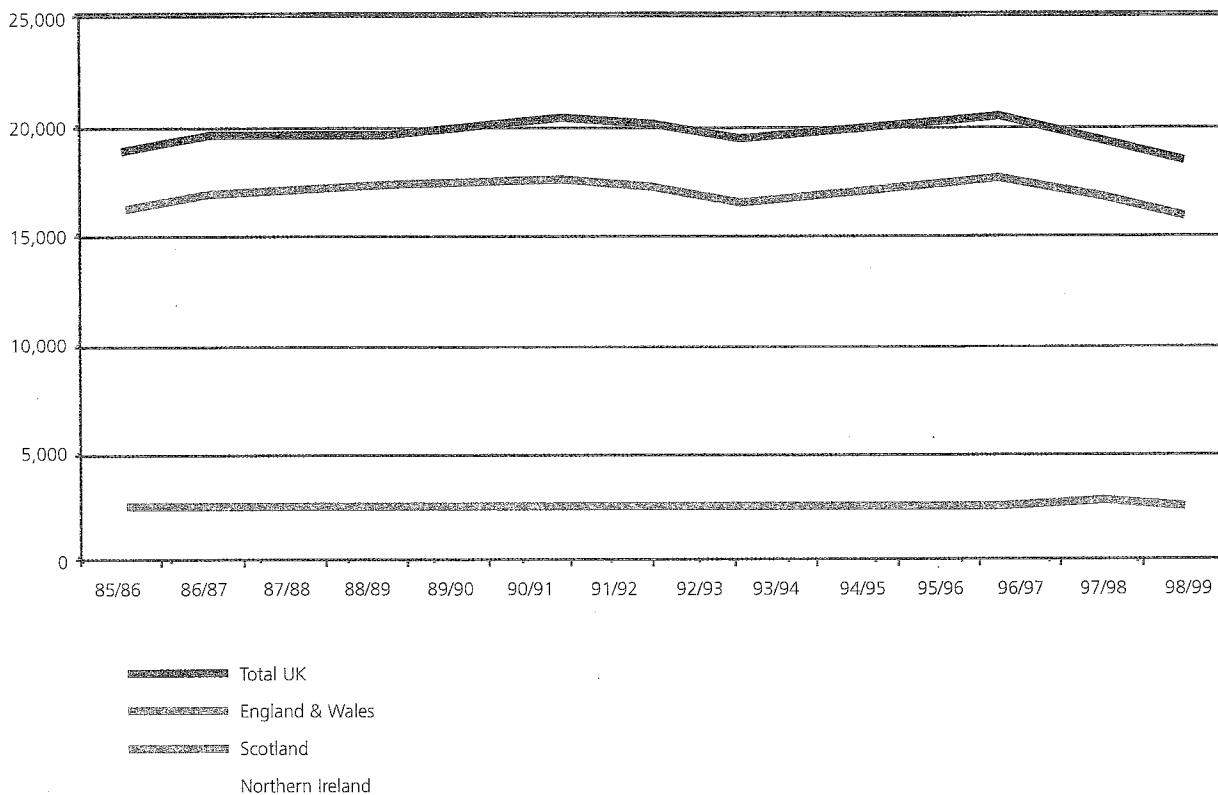
	unmeasured ¹ potable	measured potable	non-potable	TOTAL ²
TOTAL UK	12,373.83	5,334.47	293.02	18,001.32
Water service companies				
Anglian	633	479	39	1,151
Dŵr Cymru	720	229	130	1,079
Northumbrian	422	223	0	645
North West	1,404	573	86	2,063
Severn Trent	1,254	615	0	1,869
Southern	408	180	12	600
South West	299	135	0	434
Thames	1,803	678	0	2,481
Wessex	252	135	0	387
Yorkshire	851	387	0	1,238
Total WSCs	8,046	3,634	267	11,946
Water supply companies				
Bournemouth & West Hampshire	85	69	0	154
Bristol	213	87	12	312
Cambridge	42	28	0	71
Cholderton	n/a	n/a	n/a	n/a
Dee Valley	36	27	1	64
Essex & Suffolk	269	162	0	431
Folkestone & Dover	30	19	0	49
Hartlepool	15	16	2	32
Mid Kent	111	48	0	159
North Surrey	88	41	0	129
Portsmouth	130	44	0	174
South East	189	194	n/a	383
South Staffordshire	250	81	0	331
Sutton & East Surrey	118	34	1	153
Tendring Hundred	20	10	0	30
Three Valleys	524	158	0	682
York	34	12	0	46
Total WSCs	2,153	1,030	15	3,198
TOTAL England & Wales	10,199	4,663	282	15,144
East Scotland	527	196	0	723
North Scotland	214	96	2	312
West Scotland	900	221	9	1,130
TOTAL Scotland	1,641	513	11	2,165
Northern Ireland	534	158	0	692

¹ Unmeasured water includes water delivered to unmeasured properties (including supply pipe losses) as well as distribution losses, operational uses and the miscellaneous water taken (includes fire fighting)

² Totals may not add up due to rounding

n/a = not available

3.7 public water supplied '85 to '98/99 in UK (MI/d)



TREATMENT OF DRINKING WATER

Treatment is the term used to describe a series of processes raw water is subjected to in order to make it safe for human consumption. The degree of treatment needed depends on the source of the water – river, reservoir or underground aquifer – and the nature of the catchment. For example, in areas of intensive agriculture, some pesticides will be present in the raw or untreated water. These pesticides will have been washed off fields by rain into rivers and reservoirs. Ground water generally requires far less treatment – perhaps just disinfection – as the rocks have already acted as a natural filter.

The major water treatment processes and the order in which they take place are:

Screening

Debris such as leaves and plant fragments are removed by passing the water through a series of coarse meshes.

Ozonation

Ozone, a chemically active form of oxygen, is passed through the water to destroy micro-organisms. Ozone treatment is becoming more common in the UK, but is not necessary in all areas.

Coagulation

Particles which are too small to be removed by the screens are made to bind together to form larger particles by the addition of an approved chemical. This is called coagulation.

Clarification

The coagulated particles are separated from the water to form a sludge. This sludge is then removed for disposal.

Filtration

The newly-clarified water passes through sand and gravel which removes any remaining particles. To keep the filters clean, they are periodically back washed. This involves clean water being forced back through the filter to remove

any build up of particles. Once water has been filtered it is clean and colourless.

pH correction

The acidity or alkalinity of any substance is measured by its pH value. The water's pH value can be altered by the addition of chemicals to improve its physio-chemical properties.

Phosphate dosing

In areas where the water is soft i.e. contains little calcium, minute quantities of lead from old pipes can dissolve into the water. Phosphate – a common chemical present in most foodstuffs – is added to prevent this happening by

coating the lead pipes and preventing the lead pick up.

Chlorination

Before being pumped into storage and the distribution network linked directly to customers' homes, chlorine is added to the water to ensure no micro-organisms can contaminate it. (It was the addition of chlorine to tap water in the Victorian era which wiped out cholera in the UK.)

Storage

Before being pumped to homes, the treated water will usually be pumped into a sealed storage reservoir. Many of these storage reservoirs are underground.

3.8 average household water use

Some examples of the amount of water used in everyday activities in the household are:

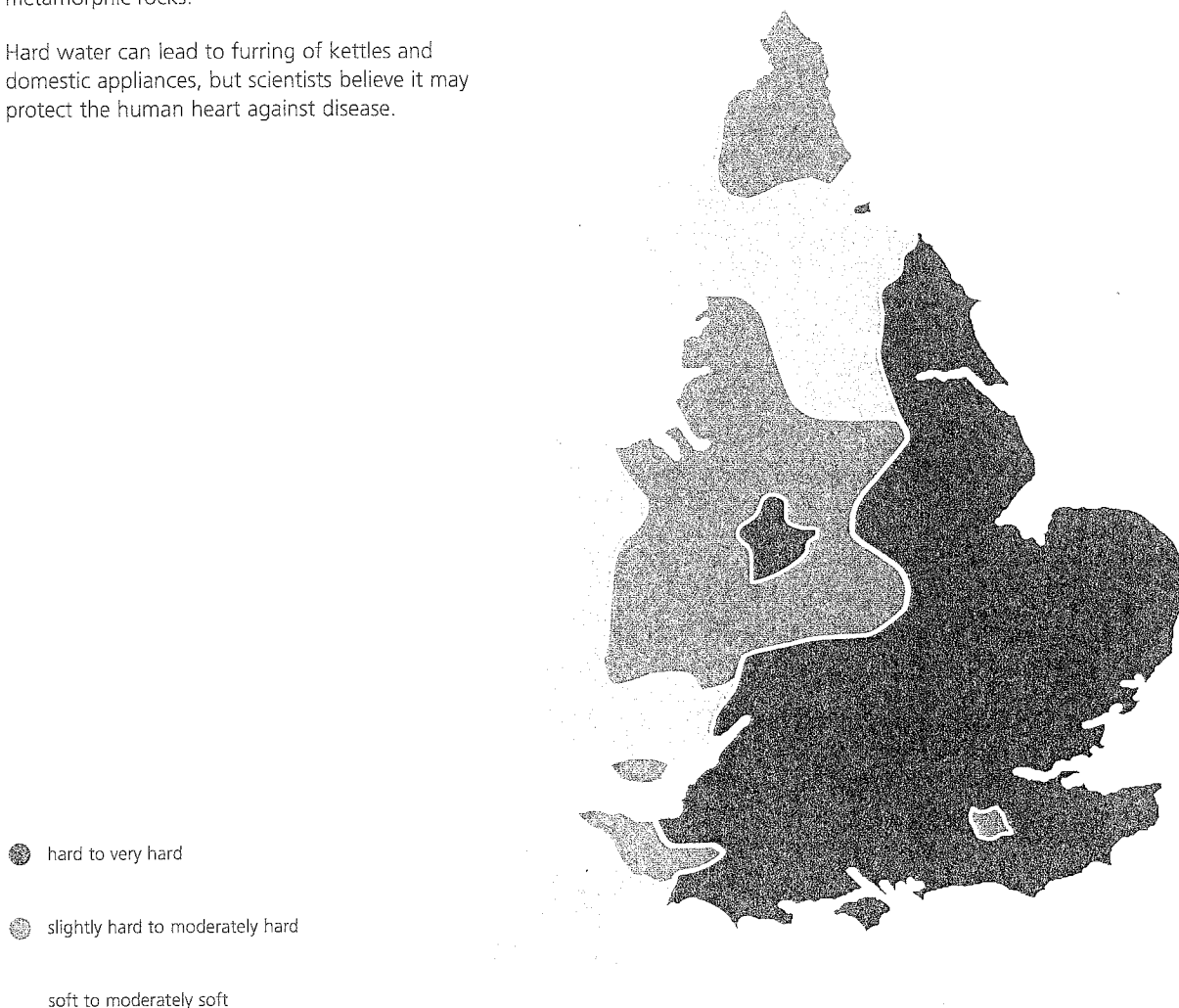
Taking a bath	up to 80 litres
Taking a shower	up to 35 litres
Flushing the toilet	up to 10 litres
Watering the garden using a sprinkler	up to 1,020 litres/hour
Using a washing machine	up to 80 litres
Using a dishwasher	up to 35 litres
Drinking and cooking use	up to 10 litres/day

In 1961 domestic consumption was 85 litres per head per day. In 1997 domestic consumption was 160 litres per head per day.

3.9 water hardness

The hardness or softness of water depends on the amount of calcium in it. The more calcium it contains, the harder it is. When rains falls, it contains no calcium, but as it flows over the land and through rocks, it picks up calcium, therefore becoming harder. The amount of calcium picked up will depend of the amount of calcium in the local rocks. Generally speaking, sedimentary rocks – more common in the south and east of the UK – contain more calcium than igneous or metamorphic rocks.

Hard water can lead to furring of kettles and domestic appliances, but scientists believe it may protect the human heart against disease.



©British Water Scotland and N. Ireland not available

3.10 drinking water quality compliance in England & Wales '90 to '98

Percentage of zones complying at all times with prescribed concentrations or values

Percentage of zones complying in:

Parameter	1990	1991	1992	1993	1994	1995	1996	1997	1998
Coliforms	90.9	94.8	96.7	98.9	99.5	99.4	98.8	98.5	99.4
Faecal Coliforms	87.6	89.3	90.0	93.6	95.1	95.8	96.2	96.1	97.3
Colour	98.4	98.6	99.1	99.3	99.4	99.8	99.9	99.6	99.6
Turbidity	94.6	94.3	95.2	96.1	96.4	96.4	96.1	97.3	96.1
Odour	96.8	98.0	99.0	99.3	99.3	99.1	97.1	98.4	99.5
Taste	96.8	97.8	98.5	98.9	98.7	99.1	99.5	99.5	99.5
Hydrogen ion	91.8	92.4	93.3	94.3	96.1	97.1	98.3	98.4	98.2
Nitrate	96.9	96.4	96.4	98.0	98.2	98.9	99.5	99.6	99.5
Nitrite	88	87.7	89.7	90.5	90.2	89.8	91.3	91.1	91.7
Aluminium	89.8	91.3	93.7	94.6	97.1	96.3	97.2	97.7	98.2
Iron	70.4	69.0	69.1	74.0	75.9	75.2	76.1	76.9	78.6
Manganese	90.3	98.6	91.6	93.1	94.3	91.7	91.8	92.3	93.8
Lead	76.6	74.4	78.9	79.1	80.2	81.3	86.9	88.6	89.3
PAH	96	93.2	91.4	89.9	88.0	87.3	86.6	87.5	87.6
Trihalomethanes	96.7	95.1	94.8	95.5	97.7	99.4	99.7	98.7	97
Total pesticides		85.4	86.7	88.1	89.1	91.2	97.5	99.6	99.9
Individual pesticides	70.2	69.4	70.2	72.1	76.3	79.2	87.0	94.6	98.1
Other parameters		93.9	94.9	97.2	98.1	98.2	97.7	98.9	98.9

Source: Drinking Water 1998: A report by the Chief Drinking Water Inspectorate

3.11 drinking water compliance in Scotland for '96/97 and '98

Percentage of zones complying at all times with prescribed concentrations or values

Parameter	1996%	1997%	1998%
Total coliforms	79.25	75.93	97.64
Faecal coliforms	80.72	81.14	99.45
Colour	91.83	92.26	98.77
Turbidity	96.90	97.81	99.67
Hydrogen ion	94.12	93.94	99.65
Aluminium	89.22	90.91	98.56
Iron	79.74	78.96	96.38
Manganese	92.81	94.11	99.48
Lead	88.73	93.27	98.98
Total trihalomethanes	65.69	58.71	64.74

Source: Drinking Water Quality in Scotland 1998 published by the Scottish Office

DRINKING WATER QUALITY IN THE UK

Water suppliers in the UK are required by law to provide wholesome, safe water. To do so, they have to comply with tough European and UK standards – standards which govern colour, taste, smell, temperature and set levels for over 50 different chemicals in water. The UK has one of the best records on drinking water quality in the world and has one of the most open systems, which includes the publication of annual reports.

Most of the standards used to test drinking water are a result of the European Commission Drinking Water Directive. The directive was translated into a set of UK regulations in the early 1980s. The EC has now revised the directive, resulting in even higher standards.

Possibly the most significant change for the water industry in the revised directive is a reduction in the level of lead permissible in drinking water from 50 micrograms per litre down to 10 micrograms. When water leaves a water treatment works, it contains virtually no lead. But until the 1960s, many water pipes were made of lead and minute quantities of the metal can dissolve into the water as it passes through the pipes – particularly in areas of softer water. The new European standard may mean that old lead pipes will have to be removed. This would cost several billion pounds.

Cryptosporidium is a common micro-organism which can be found in both the air and water. It comes mainly from the waste of farm animals. On very rare occasions, enough cryptosporidium can get through the water treatment process to cause sickness and diarrhoea in some people who drink it. The Government has introduced new regulations on the way in which the industry monitors for the presence of cryptosporidium in water.

3.12 drinking water quality standards

Parameters tested in the UK ¹	What it means	amount allowed
Temperature	The standards require water to be supplied below a certain temperature.	25°C
pH	This is the measure of the acidity or alkalinity of water.	5.5 – 9.5
Colour	This is an aesthetic requirement – water should be clear and bright, but may occasionally show a slight reddish or yellowish tint caused by iron from iron mains. This is not harmful to health. There are major programmes under way to replace or reline old mains.	20 Hazen units on colour scale
Turbidity	Sometimes water appears milky because of air bubbles. This is not harmful and if the water is left to stand for a few minutes it will clear from the bottom upwards.	4 Formazin turbidity units
Total dried solids	Water samples are dried, so that water companies can weigh any residual substances such as minerals.	1500 mg/l
Qualitative odour	Water may smell of chlorine as a small amount of chlorine is added to water before it leaves the treatment works to ensure that the water remains safe on its journey to taps. It is not harmful to health.	Samples are frequently checked and any significant odour is investigated.
Qualitative taste	If water has been standing in pipework for some hours it may have a flat or metallic taste. It may help to flush the tap before taking water for drinking.	Samples are frequently checked and any significant taste is investigated.
Dilution odour Dilution taste	These are quality control tests to measure the level of odour and taste and are carried out by specialist tasting panels.	Dilution number 3 at 25°C
Conductivity	By passing an electric current through water, water companies can measure levels of mineral salts it contains.	1500µS/cm at 20°C
Total hardness	Hardness is usually caused by the rocks through which the water passes eg chalk. Hardness means you may use more soap when washing and hard water lathers less than soft water. It has no adverse effects on health – indeed, research has shown that in hard water areas there is less incidence of heart disease.	Standards only apply if water is softened when the minimum standard is 60 mg/l as calcium.
Alkalinity	Alkalinity, like hardness, comes from the rocks through which the water has passed. Alkalinity is naturally present in water but can be altered through softening.	Standards only apply if water is softened when it is 30 mg/l as bicarbonate
Residual free chlorine	Chlorine added to water to neutralise bacteria. Some remains as 'residual free chlorine' to maintain wholesome water as it passes through the system and to the tap.	Results are compared against a long term average. Any significant difference is investigated.
Total coliforms	These are bacteria which can be found sometimes in untreated water. Disinfection during treatment removes them. However, they may sometimes appear in tests in small numbers, although follow-up tests usually show that the mains water is satisfactory. Where necessary, their presence results in immediate investigatory work.	0/100 ml
Faecal coliforms		0/100 ml
Clostridia		Not more than 1/20 ml
Faecal streptococci		0/100 ml.

3.12 drinking water quality standards continued

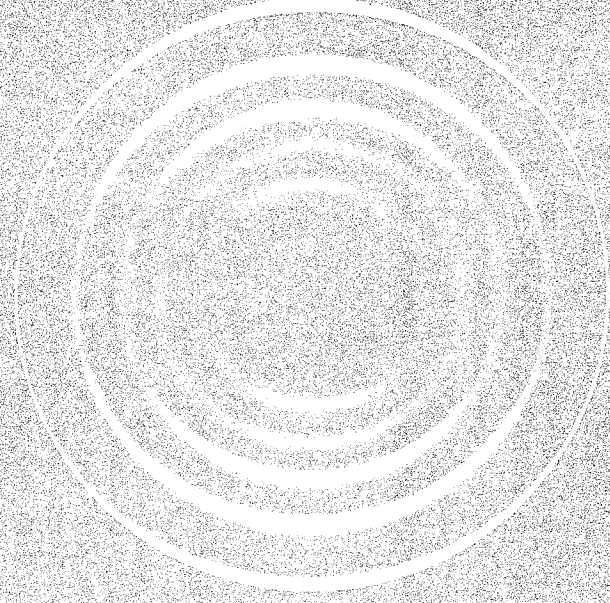
Parameters tested in the UK ¹	What it means	amount allowed
Colony count 1 Day Colony count 3 Day	Small amounts of harmless bacteria can be present in treated water – as they are in foods like yoghurt. Water companies check the numbers of groupings of these bacteria. The information obtained helps maintain the efficiency of the water treatment process and the cleanliness of the water mains.	Results are compared against a long term average. Any significant difference is investigated.
Oxidisability	This is a very general screening test of operational significance only.	5 mg/l
Ammonium	Ammonium occurs naturally in water from some sources. It does not cause health problems and where it does occur, it can be controlled or removed by treatment.	0.5 mg/l
Nitrite	Both these substances are found in water running over and through agricultural land.	0.1 mg/l
Nitrate		50 mg/l
Chloride	Chloride comes from the rocks through which water has passed. It is not harmful to health.	400 mg/l
Fluoride	Fluoride occurs naturally at varying levels. Some companies add fluoride at the request of health authorities.	1500 µg/l
Phosphorus	These substances occur naturally in water and come from mineral deposits.	2200 µg/l
Sulphate		250 mg/l
Magnesium		50 mg/l
Manganese	Manganese occurs naturally in water and is not harmful to health.	50 µg/l
Aluminium	Aluminium occurs naturally and is also used to remove impurities from water in some water treatment works. Its use in water treatment is very closely controlled and continually monitored.	200 µg/l
Calcium	Calcium is a naturally occurring substance, for example, in chalk, and is responsible for the degree of hardness of the water.	250 mg/l
Potassium	Potassium occurs naturally in water.	12 mg/l
Sodium	Sodium salts are naturally occurring and are a by-product of softening.	150 mg/l
Copper	Traces of these metals are occasionally found in water. They usually come from older pipework.	3000 µg/l
Zinc		5000 µg/l
Iron	Iron is found naturally in some underground water. At sources where natural iron levels are high, treatment plants are provided to remove it. Iron is also used in water treatment where its use is closely controlled. It does not cause health problems.	200 µg/l
Lead	Lead was formerly used as a plumbing pipe material, particularly in customers' plumbing. Lead in amounts well above the standard can be a health risk if consistently consumed over many years. Soft water in particular can dissolve lead from lead pipes. 'Dosing' reduces plumbosolvency.	50 µg/l

3.12 drinking water quality standards continued

Parameters tested in the UK ¹	What it means	amount allowed
Silver	These substances are rarely found in water.	10 µg/l
Antimony		10 µg/l
Arsenic		50 µg/l
Barium		1000 µg/l
Boron		2000 µg/l
Cadmium		5 µg/l
Chromium		50 µg/l
Cyanide		50 µg/l
Mercury		1 µg/l
Nickel		50 µg/l
Selenium		10 µg/l
Total organic carbon	By monitoring the level of naturally occurring carbon, water companies can ensure that treatment processes are working properly and no problems are developing.	Results are compared against long term average. Any significant difference is investigated.
Trihalomethanes	THMs derive from the combination of chlorine with organic matter	100 µg/l
Carbon tetrachloride	These substances arise from industrial processes but can be removed during treatment. Water companies work with the industries themselves to ensure they do not reach the water supply in the first place.	3 µg/l
Trichloroethene		30 µg/l
Tetrachloroethene		10 µg/l
Total Polyaromatic Hydrocarbons (PAHs)	PAHs are organic chemicals formed during heating or partially burning chemicals such as coal, wood or garden refuse. PAHs are widespread in the environment and have been detected in food, air and water.	200 ng/l
Benzo 3, 4 pyrene	A PAH.	10 ng/l
Surfactants	These substances come from washing powders	0.2 mg/l
Individual pesticides	Water companies test for the various herbicides and pesticides which may be used in their areas and which may be present in water. These come from their use by farmers, local authorities, gardeners etc. The traces found are no threat to health, being far smaller than the limits which the Government's medical advisers say would be necessary to protect health, but water companies are nevertheless taking steps to remove even these minute traces.	0.1 µg/l
Total pesticides		0.5 µg/l

¹ UK standards are based on European Directive 80/778/EEC although in some cases there are additional UK parameters, or those in the UK are more stringent, eg lead.

sewage and sewage sludge



The provision of drinking water is only half of the UK water industry's work. The provision of effective and safe sewerage services is the other.

Wastewater or sewage is collected from properties and businesses, taken through the sewerage system to treatment works where it goes through a number of processes designed to separate water from solid material. Human waste products form a relatively small percentage of the total volume of sewage. The treated water – effluent – is returned to rivers and seas while the solid matter – sewage sludge – is disposed of in a number of different ways including incineration, landfill, and application to certain types of agricultural land. The dumping of sewage sludge at sea – a practice which has gone on in the industry since the last century – ceased on 31 December 1998 when new European standards came into force in the UK. Sewage treatment in the UK must comply with the provisions of the European Commission's Urban Wastewater Treatment Directive and the Bathing Water Directive. The first (see fig 4.1) specifies the

minimum standards of treatment required for wastewater from urban areas discharged into estuarial and inland waters and into coastal waters. It also deals with the disposal of sewage sludge.

As a basic rule, for all agglomerations of more than 10,000 population equivalent, (p.e.) secondary treatment has to be more stringent (secondary plus tertiary) for discharges in areas identified as sensitive.

A review was conducted in 1997 of English coastal waters identified as Areas of High Natural Dispersion (HNDAs). As a result, the government announced in 'Raising the Quality' published on 23 September 1998, that all significant coastal discharges require at least secondary level treatment. Therefore HNDA status has been withdrawn from all sites.

The Directive also lays out requirements for the protection of the environment in the disposal of sewage sludge, including its use in agriculture. These are implemented in the UK in various regulations and codes of practice.

4.1 Types of treatment required under UWWT Directive

Type of area	Size of agglomeration				
	less than 2,000 p.e.	Between 2,000 and 10,000 p.e.	Between 10,000 and 15,000 p.e.	Between 15,000 and 150,000 p.e.	More than 150,000 p.e.
Sensitive area	appropriate treatment by 2005	secondary treatment by 2005	more stringent treatment by 1998	more stringent treatment by 1998	more stringent treatment by 1998
Normal Area	appropriate treatment by 2005	secondary treatment by 2005	secondary treatment by 2005	secondary treatment by 2000	secondary treatment by 2000

p.e. = Population equivalent.

Appropriate treatment: by any process and/or collecting system which allows as regards the waters receiving the discharges, the agreed quality objectives to be met as well as the relevant provisions of Directive 91/271/EEC and other Community directives.

Appropriate treatment: if discharged into coastal water.

Normal area: body of water not identified as sensitive or less sensitive.

A total prohibition on disposal of sludge at sea, also contained within the directive, came into effect at 31 December 1998. It is expected to increase the agricultural use of sludge. Sewage operators are also introducing various treatment methods to make sludge more acceptable and easily recycled.

The disposal of sewage sludge is strictly controlled. The application of sludge to agricultural land is controlled by the Sludge (Use in Agriculture) Regulations which implements EC Directive 86/278/EEC and the Department of the Environment, Transport and the Regions code of practice (CoP). The CoP and regulations are currently being revised by DETR. In 1998, an agreement called the "Safe Sludge Matrix", between the water industry, farmers and the British Retail Consortium which represents the major food retailers, means that controls are even tighter.

Treatment works in the UK which discharge effluent to surface waters must comply with three principal parameters, dealing with suspended solids, biochemical oxygen demand and ammonia.

In addition, the EC Bathing Water Directive sets standards for 19 physical, chemical and microbiological parameters for discharges that may affect bathing water. Some of the parameters are mandatory and must not be exceeded except in specified circumstance while others are guidelines.

The most widely used parameters are total and faecal coliform bacteria, which are indicators of sewage pollution. The Directive requires that at least 95 per cent of samples must have counts not exceeding the mandatory standards of 2,000/100ml for faecal coliform and 10,000/100ml for total coliform. The Commission is currently reviewing the Bathing Water Directive.

4.2 sewerage and sewage treatment by population 1997/98

	population connected to sewer		preliminary or none %	population served by STWs by level of treatment			population connected to sea outfalls	
	000s	%		primary %	secondary %	tertiary %	short%	long%
TOTAL UK	56,730	94	11	13	55	21	5	7
Anglian	5,418	93	6	4	65	25	0	6
Dwr Cymru	2,954	93	28	5	54	13	8	20
Northumbrian	2,586	98	12	52	30	4	16	8
North West	6,799	98	6	9	63	21	5	1
Severn Trent	8,225	98	0	0	60	40	0	0
Southern	3,991	95	23	16	45	16	3	21
South West	1,396	89	22	6	32	40	13	9
Thames	11,937	98	0	0	75	25	0	0
Wessex	2,420	94	5	26	49	20	1	4
Yorkshire	4,737	99	0	2	73	25	0	3
England and Wales	50,463	96	10	12	55	23	5	7
East Scotland	1,461	97	n/a	n/a	n/a	n/a	n/a	n/a
North Scotland	1,039	86	n/a	n/a	n/a	n/a	n/a	n/a
West Scotland	2,367	97	15	25	59	1	5	10
Scotland	4,867	93	-	-	-	-	-	-
Northern Ireland	1,400	83	n/a	n/a	n/a	n/a	n/a	n/a

Note: Figures may not add up due to rounding

Source: Water companies, Scottish Office, DoE (NI) Water Service

SEWAGE TREATMENT

Sewage goes through a number of processes during treatment. These include:

Preliminary treatment

Gross solids are removed or disintegrated by passing the sewage through screens. Grit, which comes from road drainage, is also removed in specially designed tanks or channels. In some works, oil and grease are removed before primary treatment.

Primary treatment

In this first major stage of treatment, the sewage flows into settling tanks where the heavier solid material is allowed to settle to the bottom of the tank. The biochemical oxygen demand (BOD) is reduced by 20 per cent while total suspended solids are reduced to at least 50 per cent before the sewage can be discharged.

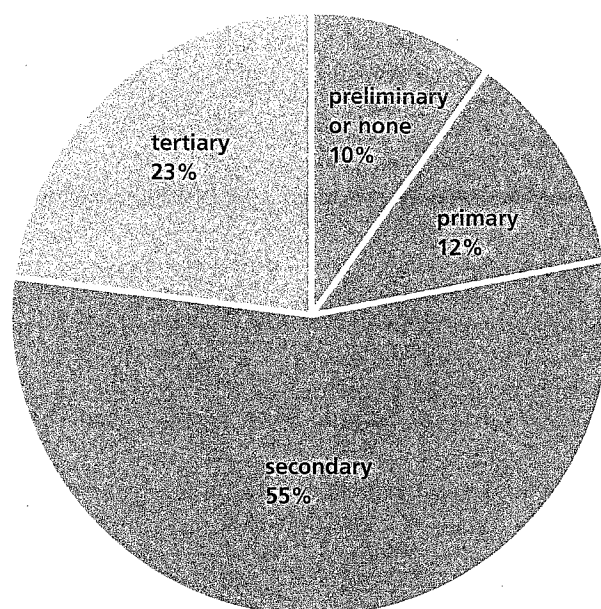
Secondary treatment

There are two main types of secondary treatment: biological filtration and activated sludge. Both use the natural action of bacteria to break down any organic matter left after primary treatment. During biological filtration, the sewage is spread over a granular filter bed. As the sewage seeps down through the filter bed, bacteria, fungi and other organisms feed on the organic matter leaving a virtually clear liquid flowing from the base of the filter bed. The activated sludge method relies on the microbiological population being mixed in suspension with the wastewater under aerobic conditions.

Tertiary treatment

In order to allow the effluent to comply with the most stringent standards before being discharged back into water, suspended matter and nutrients such as nitrogen and phosphorous are removed. Disinfection techniques, such as exposing the effluent to ultra violet rays (UV treatment), may also be applied. This is sometimes called polishing or advanced treatment.

4.3 levels of sewage treatment in England and Wales '97/98



SLUDGE (BIOSOLIDS) TREATMENT, RECYCLING AND DISPOSAL

Sewage sludge, which may be treated in a variety of ways, is the by-product of sewage treatment and is viewed as a valuable agricultural resource due to its soil conditioning properties and fertiliser value.

Thickening and Dewatering

The water content of the wet sludge is reduced by gravitational or mechanical processes. Methods used to do this include sludge consolidation centrifuges, sludge presses and vacuum filtration. Thickened or dewatered sludge contains 5-40 per cent dry solids.

Digestion

Bacteria and micro-organisms are used to break down the organic matter in the sludge. This reduces the volume of sludge solids. It also changes the form of the sludge from a dark brown, often pungent liquid to a black, tarry liquid suitable for utilisation.

Composting

This is the process of aerobic fermentation. It can take place in sewage sludge or other materials such as household waste.

Thermal drying

High temperature drying techniques reduce the sludge to a granular form which is approximately 80 per cent dry solids.

Incineration or combustion

High temperature oxidation of the sludge produces an inert ash. The heat generated in the process is usually recovered and used for other purposes.

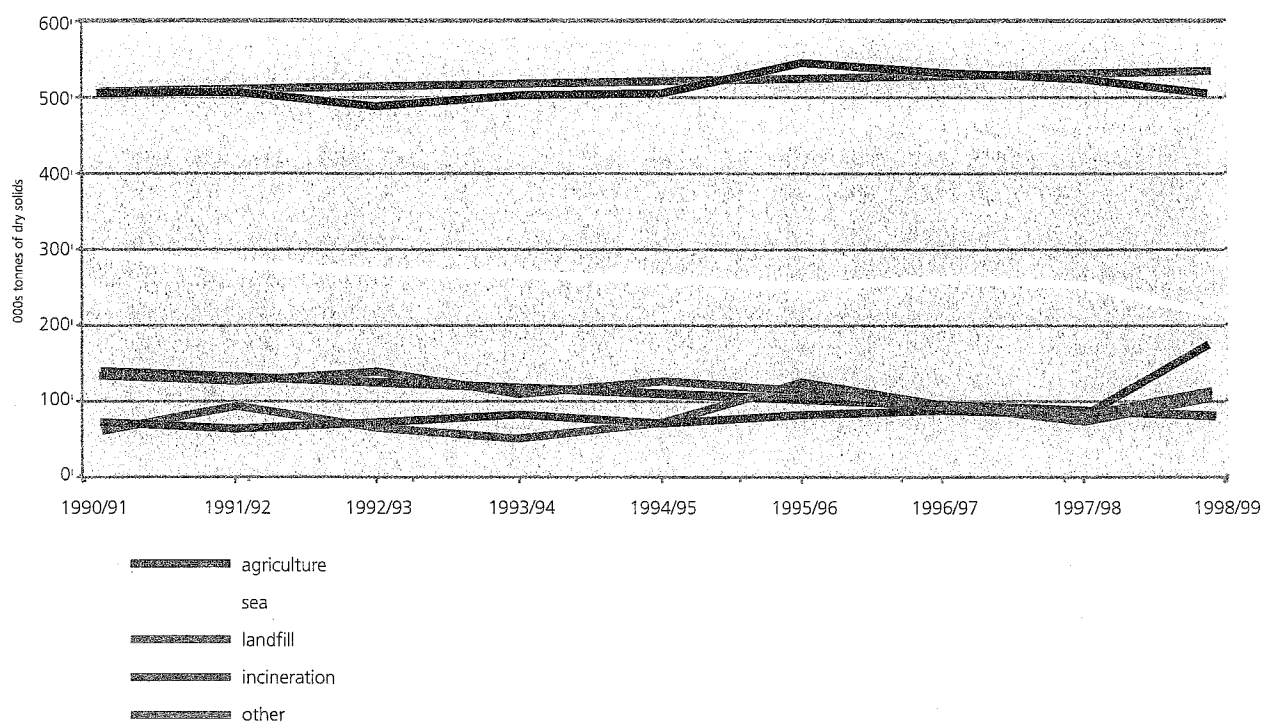
4.4 outlets for sewage sludge '98/99

	farmland	landfill	sea	incinerator	other	TOTAL
	000s of tonnes of dry solids					
TOTAL UK	504	115	150	185	105	1058
%	48	11	14	17	10	100
Anglian	76	2	5	0	14	97
Dwr Cymru	30	0	0	0	1	31
Northumbrian	4	7	14	0	4	29
North West	46	36	31	14	7	134
Severn Trent	86	28	0	23	38	175
Southern	63	4	5	4	2	78
South West	18	0	2	0	5	25
Thames	110	0	36	80	16	242
Wessex	24	2	0	0	5	31
Yorkshire	17	5	0	63	9	94
England and Wales	474	84	93	184	101	936
%	51	9	10	20	11	100
East of Scotland	6	19	0	0	4	29
North of Scotland	7	1	2	0	0	10
West of Scotland	4	11	43	0	0	58
Scotland	17	31	45	0	4	97
%	18	32	46	0	4	100
Northern Ireland	13	0	12	1	0	25
%	50	0	46	4	0	100

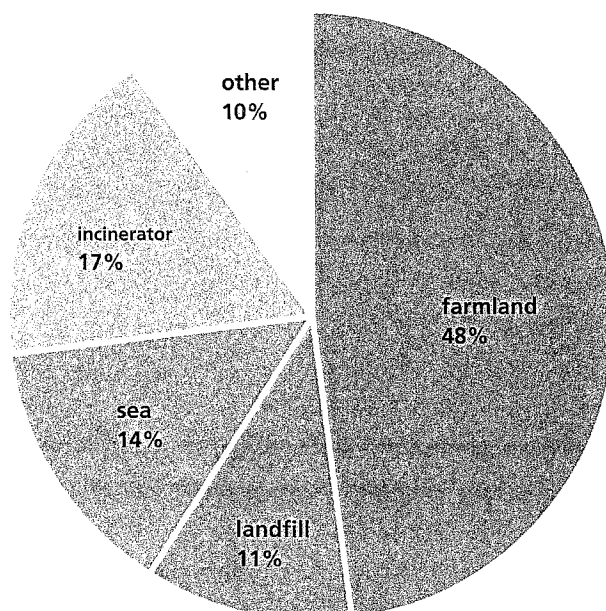
Totals may not add due to rounding

Source: Water companies, Scottish Office, DoE (NI) Water Service

4.5 outlets for sewage in the UK '90/91 to '97/98



4.6 outlets for sewage sludge in the UK '97/98



4.7 sewage treatment works - compliance with discharge consents (numeric)

EA region/Scottish	number of works monitored							% monitored that comply						
authority/NI	1991	1992	1993	1994	1995	1996	1997	1991	1992	1993	1994	1995	1996	1997
Anglian	692	685	688	687	686	687	686	92	98	96	97	98	98	98.3
North East	506	496	448	486	463	460	455	94	94	95	96	96	94	97.6
North West	373	353	356	355	356	352	350	97	98	97	98	98	98	98.3
Severn Trent	771	778	760	746	731	743	746	98	98	96	99	98	98	96.9
Southern	266	252	258	275	275	277	277	94	99	98	99	99	98	98.9
South Western	496	523	525	507	505	519	525	86	85	84	89	90	94	92
Thames	379	372	371	368	367	365	356	94	95	95	95	98	97	98.9
Welsh	578	577	639	630	621	613	583	95	96	93	94	97	96	96.4
England & Wales 1	4,061	4,036	4,045	4,054	4,004	4,016	3,978	94	95	94	96	97	97	96.9
East of Scotland						227	n/a						85	n/a
West of Scotland						164	n/a						78.7	n/a
North of Scotland						211	n/a						71	n/a
Scotland						602							78.2	n/a
Northern Ireland						n/a	111						n/a	80
TOTAL Great Britain						4,618	4,089						91.8	95.3

Totals may not add up due to rounding

Source: EA, Environment and Heritage Service NI

4.8 river and canal quality '90 to '98

Percentage of river and canal in each GQA chemical grade %

EA region	good quality				fair quality				poor quality		bad quality	
	Class A		Class B		Class C		Class D		Class E		Class F	
	1990	1998	1990	1998	1990	1998	1990	1998	1990	1998	1990	1998
Anglian	0.8	2.9	16.6	21.0	37.1	34.9	26.1	22.4	17.2	17.7	2.2	1.1
Midlands	7.9	10.7	26.6	32.0	28.2	30.0	17.4	14.0	17.6	11.9	2.3	1.4
North East	20.1	25.1	38.1	34.2	13.0	15.8	10.5	10.8	14.3	12.0	4.0	2.0
North West	22.5	28.1	19.4	26.1	17.4	17.6	13.9	11.8	20.3	13.4	6.5	3.0
Southern	10.9	13.4	32.7	36.4	30.6	27.0	13.4	11.3	10.9	10.8	1.5	1.2
South West	24.5	31.4	39.8	41.1	18.5	16.8	11.0	6.5	5.3	3.7	1.0	0.5
Thames	8.9	10.5	27.8	30.9	29.7	26.8	16.4	15.7	15.9	15.5	1.3	0.6
Welsh	44.3	64.7	35.1	23.3	10.6	6.8	5.7	2.9	3.3	2.0	1.0	0.3
Total	17.7	23.3	29.5	30.6	23.1	21.9	14.3	11.9	13.1	10.9	2.5	1.3
Northern Ireland*	6.1	8.1	38.1	43.0	40.5	31.4	10.3	13.4	3.8	3.6	1.1	0.5

Note: Some figures for 1990 have been revised.

*Based on three year cycles 1989-91 and 1996-98

Figures for Scotland are calculated using different criteria therefore no comparable data is available

Source: EA, Environment and Heritage Service NI

4.9 percentage estuary length by National Water Council water quality class (%)

EA region	good quality		fair quality		poor quality		bad quality	
	A		B		C		D	
	1990	1995*	1990	1995*	1990	1995*	1990	1995*
Anglian	79.1	68.8	13.5	21.9	7.1	2.5	0.3	7.0
Midlands	14.3	56.0	60.8	44.0	24.9	0.0	0.0	0.0
North East	29.2	44.4	39.3	40.6	23.8	10.1	7.7	5.0
North West	48.9	49.2	22.6	26.2	13.2	10.4	15.3	14.2
Southern	75.5	76.1	21.0	20.7	3.5	3.3	0.0	0.0
South West	80.0	77.3	18.9	21.6	1.1	1.1	0.0	0.0
Thames	45.2	24.8	54.8	75.2	0.0	0.0	0.0	0.0
Welsh	78.2	76.2	20.1	22.4	1.7	1.4	0.0	0.0
Total	66.3	59.1	24.1	34.1	6.5	3.6	3.1	3.3

Figures for Scotland & Northern Ireland are calculated using different criteria therefore no comparable data is available

*The comparison year has changed in this issue of Waterfacts

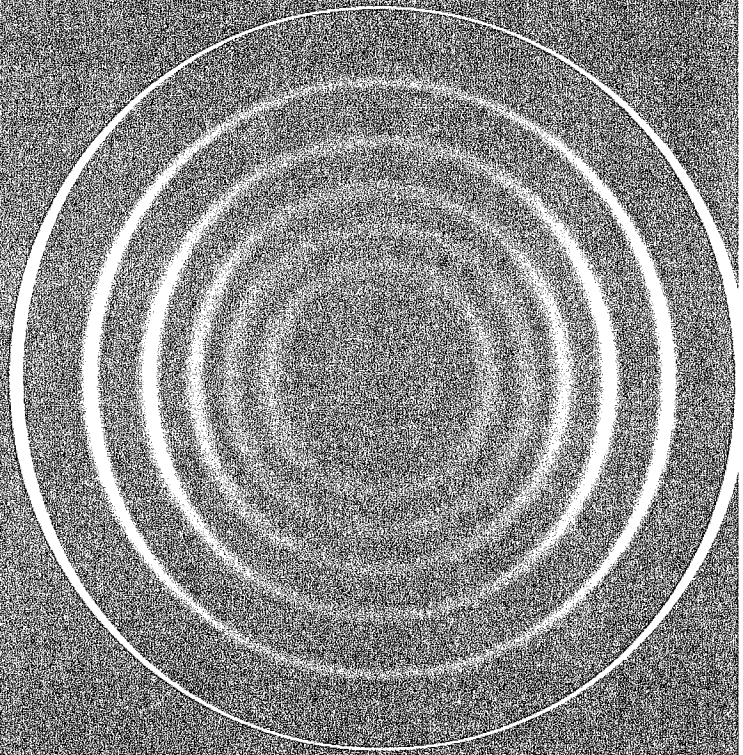
Source: Environment Agency

4.10 bathing water quality compliance (Directive 76/160/EEC) – coliform results

Number of identified bathing waters																
	1989		1990		1991		1992		1993		1994		1995		1996	
	pass	total	pass	total	pass	total	pass	total	pass	total	pass	total	pass	total	pass	total
TOTAL UK	336	440	345	446	343	453	358	455	365	457	376	457	413	464	416	472
EA region																
Anglian	23	28	27	29	29	33	31	33	28	33	27	33	30	34	34	35
Northumbrian	20	32	21	32	21	33	20	34	46	56	49	56	53	56	49	56
Yorkshire	18	22	17	22	19	22	20	22								
North West	11	33	10	33	10	33	11	33	13	33	24	33	15	33	13	33
Southern	45	65	48	66	45	67	51	67	58	67	53	67	62	67	62	69
South West	113	132	118	133	105	133	117	134	142	175	151	175	167	176	167	180
Wessex	31	38	39	39	36	39	36	39								
Thames	3	3	3	3	2	3	3	3	3	3	2	3	3	3	2	3
Welsh	40	48	35	50	45	51	39	51	42	51	39	51	49	56	52	57
England & Wales	304	401	318	407	312	414	328	416	332	418	345	418	379	425	379	433
% compliance	76		78		75		79		79		83		89		88	
Scotland:	16	23	12	23	15	23	15	23	18	23	16	23	19	23	21	23
~ North of Scotland													7	7	7	7
~ East of Scotland													8	8	8	8
~ West of Scotland													4	8	6	8
Northern Ireland	16	16	15	16	16	16	15	16	15	16	15	16	15	16	16	16
Note: the Scottish water authorities were formed on 1 April 1996, therefore no data pre-1995 is available. Severn Trent region has no identified bathing waters therefore is not included. Yorkshire and Northumbrian have merged to form Northeast, South West and Wessex have merged to form South West. * One bathing water, Redgate in the South West was closed during 1998 bathing season and is therefore not included in compliance assessment for 1998.																

Source: Environment Agency: Bathing Water Quality in England and Wales in 1998: a summary Report,
Scottish Office, DoE (NI) Water Service

paying for water services



Compared to the products of other utility industries in this country – electricity, gas and telecommunication – water is relatively cheap. Most of the cost of water is associated with its storage, treatment and distribution. Rain may fall free from the skies, but it has to be collected, treated to make it safe for human consumption and pumped through over 300,000km of mains to customers' homes.

To provide national water and sewage services of the scale and quality available in the UK costs billions of pounds a year and, unavoidably, it is customers who must pay for it.

The way bills are set, and their level, varies across the UK, reflecting factors such as the organisation and history of the service, including past levels of investment, and geographic factors such as the availability of supplies.

In Scotland, the public-owned water authorities set charges reflecting their operational costs, capital requirements and the government-imposed external finance limit, with the aim of breaking even year on year.

Charges for domestic customers are based on the Council Tax band of their home, not their water consumption. They do not receive a bill from the water authority but the charge is added to the Council Tax bill they get from their local council which also collects the money.

Non-domestic customers are billed directly by the water authority. The charge may be partly based on actual water consumption, as measured by a meter, and on the rateable value of the business.

Similarly in Northern Ireland the charges imposed by the Water Service reflect operational costs and capital requirements, taking into account Government borrowing limits. For domestic customers the charges are not billed separately but are incorporated into the domestic rates bills which are based on the rateable value of their homes and do not reflect consumption.

Industrial, commercial and agricultural customers all have water meters and receive bills based on actual consumption.

In England and Wales, the situation is more complex. Charges are based on a five-yearly price assessment or periodic review undertaken by Ofwat, the economic regulator.

The review process does not directly affect very big water users – usually industrial companies – who negotiate special prices with their water company, though prices must reflect the actual cost of delivery services.

For tariff customers – by far the great majority of all customers – the review process sets a price cap, limiting the increases companies can introduce each year. The cap is normally expressed by the formula RPI plus K where RPI is the Retail Price Index and K reflects how much a company needs to increase charges, above inflation, to finance its services and meet its legal obligations.

K, which can be positive or negative, is determined by the Director General of Water Services by taking into account a large number of factors including an allowance for past or future efficiency improvements, operating costs, investment needs and the cost of capital.

K factors are applied to a "tariff basket" of charges for water and sewage services, including trade effluent charges, covering both business customers and householders. Some charges – for instance, infrastructure charges covering the costs of connecting property to a new mains water system or public sewer – are outside the tariff basket.

A negative K suggests that customers will see a decline in prices in real terms, a positive one suggests an increase. Since the price caps apply to the average change required in the tariff basket, price changes for different classes of customer, such as domestic or industrial, may vary, reflecting changing relative costs of supplying those classes.

All domestic customers receive a water bill and those connected to the sewerage system, the great majority, also receive a charge for sewage services.

For most domestic customers, the bill is based on the rateable value of their home. Although the domestic rating system was discontinued in 1990, water companies were allowed to continue to use rateable values for charging until 2000. After a review of water and sewerage charges in England and Wales, the Government has decided to allow companies to continue using the system after that date. At the same time it proposed changes designed to encourage the use of meters on domestic properties. These changes have been implemented by the Water Industry Act 1999.

18 per cent of customers are metered, so their water bill, and any sewage bill, is based on the amount of water used. For metered customers, the sewage charges are based on the amount of water used, less a small allowance, (typically 5 per cent) for water not discharged to the sewer.

The majority of non-domestic customers are metered and thus receive a bill based on water used.

In November 1999 the Director General published final K factors for the coming five years. The new price caps will take effect from 1 April 2000.

Prices will be reduced, on average by 12% in April 2000 (known as the P₀ cut). They remain flat for two years in real terms and then start to rise again in 2003/2004. The average K reduction over 5 years is -2.1%. There are substantial variations between companies reflecting local and regional circumstances (Table 5.1).

5.1 Price limits for '95/'96 to 04/05 (%)¹

	ANNUAL PRICE LIMITS								
	1995/96	1996/97	97/98 to 99/00	2000/01	2001/02	2002/03	2003 /04	2004/05	Average ² 2000 to 05
Water and sewerage companies									
Anglian ³	1.5	1.5	1.5	-10.0	1.0	2.2	2.5	2.5	-0.5
Dwr Cymru	0.5	0.5	0.5	-10.5	-0.5	0.0	1.2	1.0	-1.9
North West	2.5	2.5	2.5	-9.3	-1.0	0.0	4.0	4.5	-0.5
Northumbrian ⁶	1.9	1.4	0.4	-19.4	-2.0	0.0	0.0	0.0	-4.6
Severn Trent	0.5	0.5	0.5	-14.1	-1.0	-1.0	0.0	1.0	-3.2
South West ³	1.5	0.5	1.0	-12.2	0.0	2.0	2.0	2.0	-1.4
Southern	4.0	4.0	4.0	-13.0	0.0	0.0	1.6	0.8	-2.3
Thames	0.5	0.5	0.5	-11.7	0.0	0.0	-0.8	0.0	-2.6
Wessex	1.5	1.5	1.5	-12.0	0.0	0.0	3.8	4.7	-0.9
Yorkshire ^{4 & 7}	2.5	2.5	1.7	-14.5	0.0	0.0	0.0	1.0	-2.9
WaSC average (weighted)	1.5	1.4	1.3	-12.3	-0.4	0.2	1.3	1.7	-2.0
Water only companies									
Bournemouth & West Hampshire	-0.5	-0.5	-0.5	-3.0	-1.7	-1.7	0.0	-1.7	-1.0
Bristol	1.0	1.0	1.0	-10.0	1.0	1.0	0.0	-1.9	-2.1
Cambridge	-2.0	-2.0	-2.0	-14.3	0.0	-1.2	-0.4	-0.9	-3.5
Cholderton ⁸	-1.7	0.0	0.0	-8.0	-5.0	0.0	0.0	0.0	-2.7
Dee Valley ⁵ : Chester	-3.0	-1.0	-1.0	-10.6	-2.6	-3.0	-3.0	0.0	-3.9
Wrexham	-2.0	-2.0	-2.0						
Essex and Suffolk	2.0	2.0	2.0	-13.8	0.0	0.0	0.0	0.0	-2.9
Folkestone and Dover	-0.5	-0.5	-0.5	0.0	1.0	3.0	3.0	3.2	2.0
Hartlepool ⁵	1.5	1.5	1.5	-	-	-	-	-	-
Mid Kent	1.0	1.0	1.0	-19.7	0.0	0.0	0.0	1.6	-4.0
North Surrey	2.0	2.0	2.0	-15.0	0.0	0.0	2.0	2.2	-2.4
Portsmouth	-2.3	-1.8	-1.5	-3.0	-1.2	-1.3	-0.5	-1.0	-1.4
South East Water ⁵ : Mid Southern	-2.4	-1.0	-1.0	-16.1	-1.0	-1.5	0.0	0.0	-3.9
South East	-1.0	-1.0	-1.0						
South Staffordshire	-4.1	-0.5	-0.5	-2.7	-1.0	-1.0	-1.0	-1.0	-1.3
Sutton and East Surrey	~	-1.2	-5.9	-17.0	-5.0	-2.4	0.0	0.0	-5.1
Tending Hundred	-0.5	-0.5	-0.5	-6.9	1.0	2.0	2.0	2.0	0.0
Three Valleys	2.5	2.5	2.5	-15.2	0.0	0.0	0.0	0.0	-3.2
York ⁷	-1.1	0.0	0.0	-9.0	-1.0	0.0	0.0	0.0	-2.1
WoC average (weighted)	-0.6	0.5	0.5	-12.4	-0.6	-0.5	0.0	0.0	-2.8
Industry average (weighted)	1.3	1.3	1.2	-12.3	-0.4	0.1	1.1	1.5	-2.1

¹ Companies are permitted to increase charges each year, on average, by RPI plus (or minus) the limit shown in this table

² The average for the price limits is the geometric average of the annual price limits

³ South West Water and Portsmouth Water referred the DG's 1994 determination to the MMC and the decisions were announced in July 1995. The MMC determined South West Water's K at 1% for 1995/96 to 1999/00, but delayed implementation until 1996/97

⁴ This includes K=0 for 1997/98, as agreed between the DG and Yorkshire Water in 1996.

⁵ Hartlepool Water merged with Anglian Water in 1998. As such there are no price limits for Hartlepool but those for Anglian apply. As part of the merger conditions, customers of Hartlepool will benefit from an additional 5% price reduction in 2001-02. They are also protected from undue discrimination in respect of prices as a separate class of water customer under the Anglian licence.

⁶ Each of these companies are the result of mergers in recent years at which price reductions were agreed as part of the condition of the merger. Some or all of these price reductions were phased to occur after 31 March 2000. The price limits take account of these merger price reductions.

⁷ Yorkshire Water and York Waterworks announced a merger in 1999 and a combined licence was issued later in 1999. As part of the terms of the merger the price limits for York are set if they were a separate company and York's customers will benefit from a further 15% reduction in addition to the 2004-05 price limit. This is subject to the outcome of a public consultation on the proposed combined licence.

⁸ Cholderton Water is an exceptionally small company.