



**BRISTOL
WATER**



**WATER QUALITY
in 2006**

Published in accordance with Regulation 36 of the
Water Supply (Water Quality) Regulations 2000

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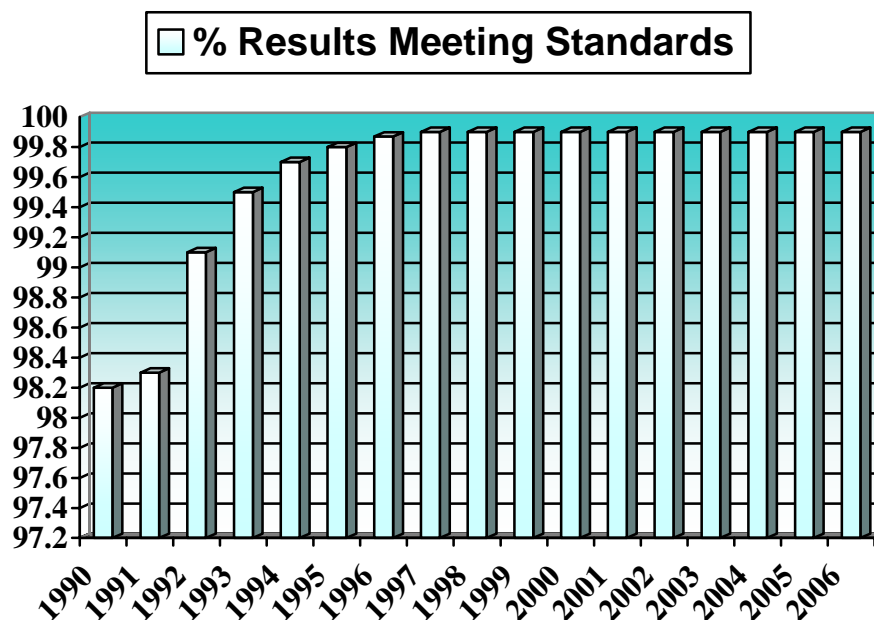
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OVERVIEW OF WATER QUALITY IN 2006

- This Annual Water Quality Report is published to comply with the reporting requirements of the Water Supply (Water Quality) Regulations 2000.
- Water quality results reported in the year ended 31st December 2006 showed that the Company has continued to meet the high standards set out in Water Supply (Water Quality) Regulations 2000. This demonstrates the continuing commitment to and substantial investment in water quality.



- More than 99.9% of all compliance analyses continue to meet the required standards as shown above.
- Where minor exceedances have arisen there would have been no adverse impact on health.
- Daily monitoring for *Cryptosporidium* continued at appropriate water treatment works during the year. No samples failed to meet the statutory treatment standard.
- Progress was made with the development of an innovative method of cleaning water mains to minimise the occasional instances of high concentrations of iron, and maintain the high water quality standards. This area presents the biggest continuing challenge and more work is planned.
- The Drinking Water Inspectorate (DWI) carried out technical audits in 2006, which are expected to report that the performance of the Company was satisfactory.
- Capital development was carried out to reduce the risk of seasonally poor raw water quality reducing the availability of water for treatment.

WATER SUPPLY ZONE QUALITY IN 2006

Parameters with 100% of samples meeting standards in 2006

1,2 Dichloroethane	Dieldrin	pH
Aldrin	Diuron	Prometryn
Alpha BHC	Enterococci (F. Strep)	Propazine
Antimony	Fluoride	Selenium
Arsenic	Heptachlor	Simazine
Atrazine	Heptachlor Epoxide	Sodium
Benzene	Isoproturon	Taste
Benzo (a) pyrene	Lindane	Tetrachloromethane
Boron	Linuron	Total Aluminium
Bromate	MCPA	Total Chloretenes
Cadmium	Mecoprop	Total Copper
Chlortoluron	Mercury	Total PAH
Chromium	Nitrite	Total Pesticides
Colour	Nitrate	Triallate
Cyanide	Nitrogen Formula	Turbidity
Dicamba	Odour	

Parameters with less than 100% of samples meeting standards in 2006

Faecal Coliforms (99.97%)	Total Haloforms (99.49%)	Total Nickel (99.74%)
Total Iron (99.00%)	Total Manganese (99.92%)	Total Lead (99.74%)

- NB. 1. There are also additional monitoring requirements for samples taken in water supply zones. Of these 99.66% of coliform tests met the required specification.
2. Further commentary appears in the main text

BRISTOL WATER plc

WATER QUALITY IN 2006

INTRODUCTION

This annual report of water quality is compiled under the format set out in the Water Supply (Water Quality) Regulations 2000 (the Regulations). It covers the 2006 calendar year. This is the second report under the 2000 Regulations, previous reporting being based on the predecessor 1989 Regulations. The change to the 2000 Regulations results in several changes to definitions and reporting requirements.

Bristol Waterworks Company was established on 17th July 1846 as a private water company. In 1991 the Company changed its corporate structure to become a non-statutory water company. At the end of 2005 Bristol Water plc was a wholly owned subsidiary of Bristol Water Group plc. With effect from May 2006 the Company became a subsidiary of the Spanish company Sociedad General de Aguas de Barcelona, S.A. Bristol Water plc is the licensed supplier of drinking water for the City of Bristol, North Somerset and parts of Gloucestershire and Wiltshire, a total area of almost 2400 square kilometres, as shown below.



The Company supplied on average, 286 megalitres of water per day (Mld) to 1.092 million people and businesses in 2006. This represents a small decrease of 2Mld in volume supplied compared to the previous year, despite an extended period of warm weather over both summer and winter. The publicity associated with drought and hose-pipe bans in the south-east of England may have led to customers moderating water consumption, even though no such restrictions were required in the Company area of supply. Industrial demand continues to decline.

Rainfall for the year to April 2007 was approximately 115% of the average expected for the Mendip area. The summer was notably hot, but not particularly dry and reservoirs were not significantly drawn down. Winter rainfall was 20% greater than average resulting in a full recharge of groundwater and reservoir systems. The breakdown of water sources used by company during the year was 15% from groundwater, 42% from reservoirs and 43% from the River Severn.

BRISTOL WATER COMPANY INFORMATION

Amount of water supplied:	287 Megalitres per day
Consumers supplied:	1.092 million
Area of supply:	Bristol surrounding parts of Somerset, Gloucestershire and Wiltshire
Water sources:	84% from rivers and reservoirs 16% from ground water
Treatment works in service:	17
Service Reservoirs in service:	174
Other supply points:	17
Km of Mains:	6,600
Water supply zones:	52

WATER QUALITY MONITORING

Bristol Water plc sampled and analysed its waters at all stages from treatment to the customers' taps according to frequencies set out in the Water Supply (Water Quality) Regulations 2000.

The Company also carried out a substantial amount of operational monitoring to check on the quality of raw waters and the performance of treatment works and other parts of the system. Operational monitoring provides more detailed information on certain aspects of our quality programme, for example the control of the corrosion of lead pipes, water mains renovation work and non-statutory monitoring such as that for *Cryptosporidium*. Much of the operational monitoring work is targeted at specific parts of our system to enable us to evaluate performance and carry out cost effective improvements.

From 2004 there were substantial changes to the Regulatory requirements for water quality monitoring. The Regulations incorporate all of the requirements of the appropriate European Directive and add some Nationally specific parameters. The principle changes were:

- Three levels of parameter
 - Measure of wholesomeness, Schedule 1 parameters, where there are prescribed concentrations or values, as in the previous Regulations.
 - Indicator parameters, where a numeric or comparative specification or standard has been set and which, if breached, must be investigated.
 - Non-classified tests where no specific standard has been set but where Company or site-specific targets are monitored against.
- Tests have been introduced for new parameters included in the 1998 European Drinking Water Directive.
- Some standards are now more rigorous, for example the lead standard became 25µg/l on 25th December 2003 and will be tightened further to 10µg/l on 25th December 2013.
- Some tests have been downgraded from being required as assessments of wholesomeness to being indicator parameters.
- Automatic Supply Point monitoring was introduced for specific parameters previously monitored at random selected customers' taps with effect from 2004. The results of analysis of these samples are shown separately.

SAMPLES TAKEN FROM WATER TREATMENT WORKS

The Company operated 17 treatment works during the period; the performance of each was continuously monitored. Some treatment works use ozone as the primary disinfectant / oxidant with or without granular activated carbon (GAC). All other works in service used chlorine as a primary disinfectant. A number of treatment works operate using membrane filtration where the risk of *Cryptosporidium* contamination of the raw water has previously been assessed as likely to arise.

All treated waters were given residual disinfection with chlorine. Chlorine residuals are continuously monitored using instruments connected via telemetry to the Bristol Water Operations Room, which is staffed 24 hours per day, every day of the year.

Assessment against required standards, (there are no authorised departures):

Quality of water leaving water treatment works (WTW)

WTW - European Standards						
Parameter	PCV	Total number of tests	Tests failed	Minimum*	Maximum*	No. of works with failures
Nitrite	0.1 mg NO ₂ /l	151	0	<0.002	0.02184	0
TOTAL	-	151	0	-	-	-

WTW - National Standards						
Parameter	PCV	Total number of tests	Tests failed	Minimum*	Maximum*	No. of works with failures
Coliform Bacteria	0 number/100 ml	3115	2	0	0	2
Cryptosporidium	ooocysts >1 in 10 litres	921	0	-	-	0
<i>E. coli</i>	0 number/100 ml	3115	1	0	0	1
TOTAL	-	7151	3	-	-	-

WTW - Additional Monitoring Requirements					
Indicator Parameter	PCV	Total number of tests	Tests Exceeding Specification	Minimum	Maximum
Colony Counts After 3 Days At 22°C	No abnormal change	3115	0	<1	30
Colony Counts After 48 Hours At 37°C	No abnormal change	3115	0	<1	78
Residual Disinfectant - Free	No abnormal change	3116	0	0.2817	1.3
Residual Disinfectant - Total	No abnormal change	3116	0	0.38	1.5366
Turbidity	1 NTU	3114	1	<0.05	0.18
TOTAL	-	15576	1	-	-

* Maxima and minima figures may be calculated 5th or 95th percentiles depending on the number of samples taken.

3116 Routine samples were taken from treatment works in 2006. In two samples, single coliform colonies were detected, one of which confirmed as faecal coliform. In 2005 3263 samples were analysed for Coliform, with no failures. 921 Samples were tested for Cryptosporidium in 2006 and all results were well within the treatment standard.

In 2006 one sample failed to meet the indicator specification for turbidity, as in 2005. Investigation did not identify a reason and all subsequent samples were satisfactory.

SAMPLES TAKEN FROM SERVICE RESERVOIRS (including Water Towers)

The Company monitored 174 separate reservoir compartments and towers. Each compartment of a reservoir or tower is monitored and reported upon separately as if it were an individual and isolated unit.

Such is the stringency of bacteriological monitoring that these results are usually the first indicator of minor structural defects, for example a leaking roof joint. For this reason regulation allows up to 5% of coliform results to fail the standard without the reservoir itself being classed as being unsatisfactory during the year. No service reservoir has had coliform detections in more than 5% of samples since 1994. The structures of all service reservoirs are inspected regularly according to a predefined programme.

Assessment against required standards, (there are no authorised departures):

Quality of water leaving service reservoirs (SRs)

SRs - National Standards						
Parameter	PCV	Total number of tests	Tests failed	Minimum*	Maximum*	No. of reservoirs failing standard
Coliform Bacteria	0 number/100 ml	8814	8	0	0	0
<i>E. coli</i>	0 number/100 ml	8814	1	0	0	1
TOTAL	-	17628	9	-	-	-

SRs - Additional Monitoring Requirements					
Indicator Parameter	0 number/100 ml	Total number of tests	Tests Exceeding Specification	Minimum*	Maximum*
Colony Counts After 3 Days At 22°C	No abnormal change	8815	0	<1	155
Colony Counts After 48 Hours At 37°C	No abnormal change	8815	0	<1	45
Residual Disinfectant – Free	No abnormal change	8816	0	<0.05	0.61
Residual Disinfectant – Total	No abnormal change	8816	0	0.06	0.78
TOTAL	-	35262	0	-	-

* Maxima and minima figures may be calculated 5th or 95th percentiles depending on the number of samples taken.

By way of comparison with previous years, of 8814 (9074) routine samples taken from service reservoirs and towers in 2006, 8 (0.09%), were found to contain coliform compared with 7 in 2004. One sample (0.01%) tested positive for faecal coliform in 2006 compared with 2 in 2005.

In any case where a presumptive result for coliform bacteria is obtained, confirmatory tests are always carried out by standard methods; further samples are obtained from the reservoir in question and, as appropriate, the distribution system. In all cases residual chlorination is measured and if necessary increased. It is standard practice to take any reservoir with a failing follow-up sample out of service for thorough inspection and resampling in increasing detail until the source of contamination is identified and eliminated, or adverse results are no longer obtained.

SAMPLES TAKEN FROM CUSTOMERS' TAPS

Samples were taken from customers' taps at randomly selected addresses in accordance with the frequencies laid out in the Regulations. The Company has no control over infringements caused by internal plumbing deficiencies. However, all breaches of the standard are thoroughly investigated.

Assessment against required standards, (there are no authorised departures):

Quality of water at customers' taps (WSZ)

WSZ - European Standards						
Parameter	PCV	Total number of tests	Tests failed	Minimum*	Maximum*	No. of zones with failures
1,2 Dichloroethane	3 µg/l	9	0	0.08	<0.08	0
Antimony	5 µg Sb/l	389	0	<0.1	0.6	0
Arsenic	10 µg As/l	389	0	<0.4	4.76	0
Benzene	1 µg/l	9	0	0.06	<0.06	0
Benzo (a) Pyrene	0.01 µg/l	389	0	<0.001	0.003	0
Boron	1 mg B/l	9	0	0.013	0.055	0
Bromate	10 µg BrO /l	389	0	<0.6	3.31	0
Cadmium	5 µg Cd/l	389	0	<0.06	0.701	0
Chromium	50 µg Cr/l	389	0	<0.3	2.55	0
Copper	2 mg Cu/l	389	0	<0.0012	0.3786	0
Cyanide	50 µg CN/l	9	0	0.4	<0.4	0
<i>E. coli</i>	0 number/100 ml	2925	1	0	0	1
Enterococci	0 number/100 ml	389	0	0	0	0
Fluoride	1.5 mg F/l	9	0	0.04	0.28	0
Lead	25 µg Pb/l	389	1	<0.5	17.3	1
Mercury	1 µg Hg/l	9	0	0.012	<0.015	0
Nickel	20 µg Ni/l	389	1	<0.9	4.93	1
Nitrate	50 mg NO /l	389	0	1.08	41.85	0
Nitrite	0.5 mg NO /l	389	0	<0.002	0.0208	0
Nitrate/Nitrite Formula	1 mg NO /l	389	0	0.0226	0.838	0
Polycyclic aromatic hydrocarbons (PAHs)	0.1 µg/l	389	0	0	0.0081	0
Selenium	10 µg Se/l	389	0	<0.2	1.4	0

WSZ - European Standards						
Parameter	PCV	Total number of tests	Tests failed	Minimum*	Maximum*	No. of zones with failures
Tetrachloroethene/Trichloroethene	10 µg/l	9	0	0.24	0.28	0
Trihalomethanes (THMs)	100 µg/l	389	2	4.883	83.371	2
Pesticides (Aldrin)	µg/l	10	0	0.001	<0.002	0
Pesticides (Alpha-HCH)	µg/l	10	0	<0.001	<0.001	0
Pesticides (Atrazine)	µg/l	10	0	0.001	0.01	0
Pesticides (Chlortoluron)	µg/l	10	0	0.002	<0.004	0
Pesticides (Dicamba)	µg/l	10	0	<0.001	<0.002	0
Pesticides (Dieldrin)	µg/l	10	0	0.002	<0.002	0
Pesticides (Diuron)	µg/l	10	0	0.003	<0.004	0
Pesticides (Gamma-HCH (Lindane))	µg/l	10	0	0.001	<0.002	0
Pesticides (Heptachlor)	µg/l	10	0	0.001	<0.002	0
Pesticides (Heptachlor epoxide)	µg/l	10	0	0.002	<0.002	0
Pesticides (Isoproturon)	µg/l	10	0	0.003	<0.004	0
Pesticides (Linuron)	µg/l	10	0	0.003	<0.007	0
Pesticides (MCPA)	µg/l	10	0	0.002	<0.002	0
Pesticides (MCP (Mecoprop))	µg/l	10	0	0.001	<0.002	0
Pesticides (Prometryn)	µg/l	10	0	<0.002	<0.002	0
Pesticides (Propazine)	µg/l	10	0	<0.001	<0.001	0
Pesticides (Simazine)	µg/l	10	0	0.001	0.005	0
Pesticides (Triallate)	µg/l	10	0	0.001	<0.001	0
Pesticides - Total Substances	0.5 µg/l	10	0	0	0.015	0
TOTAL	-	9402	5	-	-	-

WSZ - National Standards						
Parameter	Prescribed Concentration or Value	Total number of tests	Tests failed	Minimum*	Maximum*	No. of zones with failures
Aluminium	200 µg Al/l	1195	0	<5	40.04	0
Colour	20 mg/l Pt/Co scale	1197	0	<0.4	2.602	0
Hydrogen ion (pH)	6.5 -10 pH value	1194	0	7.15	7.86	0
Iron	200 µg Fe/l	1201	12	<7	210.72	10
Manganese	50 µg Mn/l	1192	1	<1.5	11	1
Organoleptic Odour	Dilution no. 3 at 25°C	636	0	0	0	0
Organoleptic Taste	Dilution no. 3 at 25°C	636	0	0	0	0
Sodium	200 mg Na/l	389	0	<0.3	143	0
Tetrachloromethane	3 µg/l	9	0	0.02	<0.04	0
Turbidity	4 NTUs	1194	0	<0.05	0.6635	0
TOTAL	-	8843	13	-	-	-

WSZ - Additional Monitoring Requirements					
Indicator Parameter	Prescribed Concentration or Value	Total number of tests	Tests Exceeding Specification	Minimum*	Maximum*
Ammonium	0.5 mg NH ₄ /l	1200	0	<0.021	0.03399
Chloride	250 mg Cl/l	9	0	16.7	21.6
<i>Clostridium perfringens</i>	0 number/100 ml	11	0	0	0
Coliform Bacteria	0 number/100 ml	2925	10	0	0
Colony Counts After 3 Days At 22°C	No abnormal change	2925	0	<1	113
Colony Counts After 48 Hours At 37°C	No abnormal change	2925	0	<1	51
Conductivity	2500 µS/cm	10	0	281	587
Hydrogen ion (pH)	9.5 pH Value	1194	0	7.15	7.86
Radioactivity - Gross Alpha	0.1 Bq/l	9	0	0.02	<0.06
Radioactivity - Gross Beta	1 Bq/l	9	0	0.04	0.11
Radioactivity - Tritium	100 Bq/l	9	0	1.5	10.2
Residual Disinfectant - Free	No abnormal change	2927	0	<0.05	0.71
Residual Disinfectant - Total	No abnormal change	2927	0	0.1	0.9072
Sulphate	250 mg SO ₄ /l	9	0	20	48.5
Total Organic Carbon (TOC)	No abnormal change	9	0	0.81	1.69
TOTAL	-	17098	10	-	-

* Maxima and minima figures may be calculated 5th or 95th percentiles depending on the number of samples taken.

Of the 2925 routine samples taken from randomly selected customers' taps in 2006 for *E. coli* analysis, 1 (0.03%) tested positive; the same figure as in 2005. From 2004 coliform became an indicator parameter. Of the 2925 tests carried out for coliform 10 (0.34%) did not meet the specification compared with only 5 (0.17%) of samples taken in 2005. Also from 2004 a new requirement to monitor for Enterococci was introduced. In 2006 389 samples were tested for Enterococci with none confirming as positive, the same as in 2005.

Additional microbiological analysis was carried out to test for indicator parameters, *Clostridium Perfringens* and colony counts.

All cases of presumptive results for coliform bacteria were subject to confirmatory tests by standard methods; meanwhile a resample was obtained, where possible, from the same building and/or neighbouring properties. Resampling continued until the cause of the positive determination had been identified or the water was shown to comply with standards. In most cases the bacterial count is very low and only rarely does a repeat sample indicate the presence of coliform.

SAMPLING AT SUPPLY POINTS

Under the previous Regulations the Company carried out all water quality sampling in distribution at either service reservoirs or at randomly selected customers taps. The 2000 Regulations make provision for certain parameters to be monitored at supply points, representative points, in the distribution system. Supply point monitoring applies only to those parameters where the quality is not expected to change in distribution between the sampling point and the consumer's tap.

Assessment against required standards:

Quality of water leaving bulk supply points (SP) Number of supply points = 17

SP - European Standards						
Parameter	Prescribed Concentration or Value	Total number of tests	Tests failed	Minimum*	Maximum*	Failures by supply point
1,2 Dichloroethane	3 µg/l	151	0	<0.08	<0.08	0
Benzene	1 µg/l	151	0	<0.06	<0.06	0
Boron	1 mg B/l	151	0	<0.013	0.17972	0
Cyanide	50 µg CN/l	151	0	<0.4	<0.4	0
Fluoride	1.5 mg F/l	151	0	<0.00952	0.4648	0
Mercury	1 µg Hg/l	151	0	<0.012	<0.015	0
Tetrachloroethene/Trichloroethene	10 µg/l	151	0	0.24	0.3136	0
Pesticides (2,4,-Db)	µg/l	191	0	<0.002	<0.003	0
Pesticides (2,4-D)	µg/l	191	0	<0.002	0.00916	0
Pesticides (Aldrin)	µg/l	185	0	<0.001	<0.002	0
Pesticides (Asulam)	µg/l	90	0	<0.005	<0.005	0
Pesticides (Atrazine)	µg/l	191	0	<0.001	0.01372	0
Pesticides (Benazolin)	µg/l	73	0	<0.002	<0.002	0
Pesticides (Bromoxynil)	µg/l	191	0	<0.001	<0.002	0
Pesticides (Carbendazim)	µg/l	189	0	<0.002	<0.0074	0
Pesticides (Carbetamide)	µg/l	32	0	<0.002	<0.003	0
Pesticides (Chlorothalonil)	µg/l	126	0	<0.001	<0.003	0

SP - European Standards						
Parameter	Prescribed Concentration or Value	Total number of tests	Tests failed	Minimum*	Maximum*	Failures by supply point
Pesticides (Chlorpyrifos)	µg/l	146	0	<0.003	<0.00459	0
Pesticides (Chlortoluron)	µg/l	188	0	<0.002	<0.00708	0
Pesticides (Clopyralid)	µg/l	191	0	<0.001	0.01524	0
Pesticides (Cyanazine)	µg/l	32	0	<0.002	<0.002	0
Pesticides (Cypermethrin)	µg/l	65	0	<0.004	<0.04	0
Pesticides (Dieldrin)	µg/l	191	0	<0.002	<0.002	0
Pesticides (Diuron)	µg/l	191	0	<0.003	<0.004	0
Pesticides (Fenpropimorph)	µg/l	191	0	<0.006	<0.006	0
Pesticides (Fluroxypyr)	µg/l	191	0	<0.002	<0.003	0
Pesticides (Gamma-HCH (Lindane))	µg/l	99	0	<0.001	0.002	0
Pesticides (Glyphosate)	µg/l	191	0	<0.008	<0.08064	0
Pesticides (Heptachlor)	µg/l	191	0	<0.001	<0.002	0
Pesticides (Heptachlor epoxide)	µg/l	191	0	<0.002	<0.002	0
Pesticides (Ioxynil)	µg/l	65	0	<0.001	<0.002	0
Pesticides (Isoproturon)	µg/l	191	0	<0.003	<0.004	0
Pesticides (Linuron)	µg/l	191	0	<0.003	<0.007	0
Pesticides (MCPA)	µg/l	92	0	<0.002	0.002	0
Pesticides (MCPP(Mecoprop))	µg/l	191	0	<0.001	0.00716	0
Pesticides (Pendimethalin)	µg/l	191	0	<0.003	<0.003	0
Pesticides (Propyzamide)	µg/l	34	0	<0.002	<0.002	0
Pesticides (Simazine)	µg/l	191	0	<0.001	0.0124	0
Pesticides (Tri-allate)	µg/l	34	0	<0.001	0.001	0
Pesticides (Trichlopyr)	µg/l	166	0	<0.003	0.005	0
Pesticides (Trifluralin)	µg/l	191	0	<0.002	<0.002	0
Pesticides - Total Substances	0.5 µg/l	191	0	0	0.08024	0
TOTAL	-	6302	0	-	-	-

* Maxima and minima figures may be calculated 5th or 95th percentiles depending on the number of samples taken.

SP - National Standards						
Parameter	Prescribed Concentration or Value	Total number of tests	Tests failed	Minimum*	Maximum*	Failures by supply point
Tetrachloromethane	3 µg/l	151	0	<0.02	<0.04	0
TOTAL	-	151	0	-	-	-

SP- Additional Monitoring Requirements					
Indicator Parameter	Prescribed Concentration or Value	Total number of tests	Tests Exceeding Specification	Minimum*	Maximum*
Chloride	250 mg Cl/l	151	0	14.164	88.944
<i>Clostridium perfringens</i>	0 number/100 ml	1162	0	0	0
Conductivity	2500 µS/cm	1163	0	272.64	752.36
Radioactivity - Gross Alpha	0.1 Bq/l	83	2	<0.01	0.16
Radioactivity - Gross Beta	1 Bq/l	83	0	0.03	0.17
Radioactivity - Tritium	100 Bq/l	63	0	<1.4	3
Sulphate	250 mg SO ₄ /l	151	0	9.316	110
Total Organic Carbon (TOC)	No abnormal change	151	0	0.2836	4.3028
TOTAL	-	3007	2	-	-

* Maxima and minima figures may be calculated 5th or 95th percentiles depending on the number of samples taken.

OVERALL RESULTS OF STATUTORY MONITORING 2000 - 2006

	2000	2001	2002	2003	2004	2005	2006
Number of Determinations	43290	43284	43702	46817	65140	59635	58371
Number Exceeding Spec.	42	39	49	34	45	29	41
% Exceeding Spec.	0.10%	0.09%	0.11%	0.07%	0.07%	0.05%	0.07%
% Compliance with Spec.	99.90%	99.91%	99.89%	99.93%	99.93%	99.95%	99.93%

The results of monitoring show consistently high quality over many years maintaining a very high level of compliance. A comment is given in the following paragraphs for all of those parameters where there has not been 100% compliance with the standards or where a particular parameter may be of general interest.

COMMENTS ON INDIVIDUAL CHEMICAL PARAMETERS IN ZONES

Lead

During 2006 one compliance sample result exceeded the 25µg/l standard for lead. Exceedances are always investigated. In this case the Company lead communication pipe was replaced, however the customer supply pipe was some 30m long and passed under a garage forecourt.

Subsequent sampling gave a compliant result, suggesting that the concentration of lead is greatly affected by amount of surface traffic in the area. This is not an uncommon situation.

Water as supplied from treatment works has a very low lead level, but lead is able to dissolve from lead pipes in the distribution system and domestic plumbing. The Company's comprehensive surveys have shown that many of the source waters would dissolve lead from both Company and customer owned pipes. To reduce the concentration of lead at the taps in those zones where there is a risk of lead concentrations exceeding the current standard, additional treatment has been installed at several water treatment works. The plumbosolvency control improves compliance with both the existing EU lead standard and that applicable from 2013 as described below.

The Company will currently replace its section of lead service pipe free of charge if a customer requests that the Company's lead supply pipe is changed and at the same time the customer replaces their own lead pipework.

The 1998 EC Drinking Water Directive and UK Regulations required that all supplies meet a 25µg/l standard from December 2003 and 10 µg/l from 2013. The table overleaf shows quality compliance against both of these standards.

The results below show the high degree of compliance with the standards. It is unlikely that further improvement can be made without significant replacement of both Company and customer lead pipes.

Lead compliance against previous, current and new standards

	Samples taken	Percentage compliance against standards	
		25 µg/l (from Dec 2003)	10 µg/l (from 2013)
2006	382	99.7%	98.2%
2005	390	99.7%	99.0%
2004	390	99.2%	96.9%
2003	217	99.5%	95.9%
2002	213	100%	98.1%
2001	210	100%	98.1%
2000	212	99.1%	97.2%
1999	210	100%	93.8%
1998	216	100%	97.7%

**Note, all samples were first draw samples taken for compliance purposes from randomly selected properties, including non-lead properties.
The results show a stable situation consistent with this type of sampling.**

Iron

The iron standard was exceeded in 12 compliance samples (1.0%) during the year compared with 0.5% in 2005. Although this represents a relatively small level of non-compliance the Company is aware that from time to time disturbance of water mains sediments arising from corrosion does cause annoyance to customers. Since 1996 nearly 500 km of water mains have been renovated. Follow-up appraisal has indicated that significant improvements in water quality have resulted from the work.

New investment from 2005 on additional valving in the mains network will enable improved management of the distribution system to allow easier removal of sediments and reduce the number of discolouration complaints further. In the short-term this work had probably increased in amount of iron mobilised in the network.

During the past year Bristol Water has worked with the University of Bristol to develop their innovative pipe cleansing technique using slush ice for use in larger diameter water mains. The early indications are that the technique is effective and the Company is currently investing in large-scale equipment to make and use slush ice. If successful this will be a first for the water industry anywhere in the world.

Manganese

One sample exceeded the PCV for manganese during the year. Mains' flushing causing a disturbance to the local distribution system was considered to be the reason. The situation was quickly rectified.

Nickel

A single first-draw sample failed to meet the standard during the year with a concentration of 112µg/l against a standard of 20 µg/l. Although this result was considerably above the standard it was most unusual and nearly 100 times higher than the next lowest value. It is believed that recent plumbing at the property concerned was the cause of the elevated value.

Nitrate

No samples failed to meet the nitrate standard during the year despite significant raw water nitrate contamination. Nitrate arises from environmental contamination of the source water, the Gloucester and Sharpness Canal, under rare extreme winter weather conditions. The Company gave an undertaking to control nitrate infringements and a scheme was completed during the year to improve nitrate management.

Trihalomethane

A single event gave rise to two breaches of the trihalomethane (THM) standard in water supply zones fed from the same treatment works. The exceedances were caused by our use of chlorine to control Zebra Mussel growth in a raw water pipeline. This control method has been practiced for many years without previously causing problems never the less the Company is reviewing its operational practice to see how it might be improved.

Radioactivity – Gross Alpha

Two samples gave rather strange results that showed slight exceedances of the indicator standard. The required response to a result that exceeds the standard is to carry out more specific analysis to determine the source and type of radioactivity (Total Indicative Dose). In the case of the two samples which exceeded the gross alpha indicative value the follow up measurement met the required standards.

WATER QUALITY INCIDENTS

No water quality incidents were notified to the Drinking Water Inspectorate in 2006

FLUORIDATION

Chemical fluoridation of water supplies does not take place anywhere in the Company's area although the natural fluoride level is relatively low. The law regarding fluoridation has been changed to allow Strategic Health Authorities, after local public consultation, to require a water company to dose fluoride into drinking water supplies. The procedures for consultation have not yet been published by the Government, however the change in the law has generated adverse comment from some customers.

CRYPTOSPORIDIUM AND GIARDIA

The Company commenced a programme of routine sampling for *Cryptosporidium* oocysts and *Giardia* cysts in 1990. In addition the Company has co-operated with Health and Local Authorities in the development of plans to monitor closely for the disease. Jointly with these authorities and other local water supply undertakings in the South West, an Outbreak Control Plan has been developed for use in the event of any outbreak of the disease that is suspected to be of water related origin.

During 1999 new Regulations were implemented in England and Wales requiring risk assessment and monitoring for *Cryptosporidium*. The new Regulations introduced new and more stringent sampling and analytical methodology from April 2000 for several water treatment works where a risk assessment has identified an increased risk of oocysts being present in the raw water.

In response to the risk assessments the Company carried out a substantial programme of treatment works enhancement at several treatment works treating ground water.

Several sites have had monitoring equipment installed to allow continuous sampling in accordance with the new analytical method. Statutory analysis was carried out on samples on a daily basis. 1060 regulatory *Cryptosporidium* analyses were carried out on statutory and operational samples taken from treated water supplies. All supplies met the treatment standard of less than 1 oocyst per 10 litres.

DRINKING WATER RISK ASSESSMENTS

In common with the rest of the UK industry, Bristol Water has embarked on a project to review the areas of risk associated with the reliable provision of safe drinking water. The objective of the exercise is to identify the source, impact and appropriate control of hazards in the water supply chain from source to tap. The project builds on the already extensive risk management practices operated by the Company and whereas it will not improve water quality it is intended to ensure that the already high quality of drinking water can be maintained despite reasonably foreseeable challenges. The work should also assist in risk-based planning of maintenance and capital development.

CUSTOMER COMPLAINTS

Part of the routine monitoring is related to customer complaints, which are all logged and evaluated or investigated to enable improvements to take place. Our objective is to control unnecessarily high levels chlorine concentrations, which are not appreciated by some customers, yet still maintain good microbiological quality at the tap.

In the past customers have indicated their concern over water hardness and scale. Hardness is related to the geology of the water catchments from which the raw water resources are derived. The Company has been able to achieve lower levels of hardness in many zones by blending treated waters derived from different sources. There has been a good customer response to this action. No chemical processes are used to reduce hardness artificially.

The most significant area of customer complaint is on the occasions when long-term iron deposits arising from corrosion in water mains has been disturbed and has caused the water to be turbid and /or discoloured. The Company has carried out improvements to the distribution system recently to enable better management, with the objective of reducing this situation.

WATER QUALITY INFORMATION

The Company has actively continued to promote its customers' understanding of water quality issues, both directly through open days and school visits and via the media through informative advertisements and the Internet (<http://www.bristolwater.co.uk>). Customers have indicated that they appreciate the efforts made to inform them about water quality matters.

The Drinking Water Inspectorate also makes drinking water quality information for individual companies and as regional summaries available on its website at:
<http://www.dwi.gov.uk/pubs/annrep06/contents.shtm>.

PUBLIC RECORDS

Bristol Water plc maintains a public register of information as required by the Water Supply (Water Quality) Regulations 2000. Anyone may inspect any record maintained in accordance with these Regulations at the Head Office of the Company on Bedminster Down, between 9 am and 4 pm on any working day.

Alternatively the Company's customers may write to:-

PO Box 218,
Bridgwater Road,
Bristol
BS99 7AU

to request a copy of any relevant information and this will be supplied free of charge for the zone in which the customer receives water.

Quality Director
June 2007

APPENDIX 1 - WATER QUALITY TESTING - GENERAL INFORMATION

People now show more interest in their drinking water – we welcome this.

Drinking water is surprisingly complex and will vary from area to area, usually because of the different rocks over which it passes.

All water we supply is treated before being piped to customers' homes. In the Bristol Water area, 75% of the water we use is from surface water sources such as lakes and rivers, while the remainder is from groundwater sources such as wells and springs.

Water is treated for three reasons:

- To make it safe to drink
- To remove any particles present
- To remove taste and odour

LEGAL REQUIREMENTS

Water Companies must supply wholesome water as defined under the current Water Supply (Water Quality) Regulations, which set out in detail the acceptable standards for drinking water.

Copies of these Regulations and the Acts of Parliament are available on the internet at <http://www.dwi.gov.uk/regs/regulations.shtm>
They include EC requirements, set out in Council Directive 98/83/EC.

These Regulations include non-mandatory indicator standards as well as mandatory standards. In this leaflet, all the standards are shown, but where these are not mandatory this is stated.

"AUTHORISATIONS"

DEFRA may authorise a temporary supply of water which does not meet all the requirements of the Regulations if:

- The water does not constitute a potential danger to human health
- There is no other realistic way to maintain a water supply
- The Company has proper plans in place, agreed with DEFRA, to meet the standards

Authorisations can run for a maximum of three years.

WATER TESTING

We take samples at water sources; at treatment works; service reservoirs (large covered storage tanks in our supply network, such as water towers); and at customers' taps. Samples taken as required by the Regulations are called compliance samples and results can be seen in a Public Register of Information at our Head Office.

Approximately 100,000 compliance tests are done each year. Over 99.9% of these tests meet the

required standards.

Water quality is continuously monitored at treatment works: these automatically shut down if set limits are exceeded.

Units of Measure

Results are placed on a public register which customers are welcome to see at water company offices.

The units used in measurement are exceedingly small, for example:

- 1 milligram/litre (mg/l) is 1 part in 1,000,000
- 1 microgram/litre ($\mu\text{g/l}$) is 1 part in 1,000,000,000
- 1 nanogram/litre (ng/l) is 1 part in 1,000,000,000,000

Many of the measurements we make are actually close to the limits of detection even with the most sophisticated instruments.

What if a Test Fails?

When a sample is analysed and fails a test standard, it does not necessarily mean that the water is unfit to drink. Sometimes the failures are caused by the householder's own plumbing system, whilst the water in the mains and in neighbouring properties is good. Even a dirty tap can cause a test failure.

But any failure of the standards is taken seriously. Water companies investigate them thoroughly and, where necessary, do everything possible to cure the faults.

Laboratory tests fall broadly into three categories, physical, chemical and bacteriological. The following table shows the tests, which are carried out, their significance and the standards.

APPENDIX 2 - 2004 QUALITY STANDARDS FOR DRINKING WATER

SUBSTANCE TESTED UNDER BRITISH LAW	WHAT IT MEANS	AMOUNT ALLOWED
Microbiological parameters		
Faecal Coliforms (also known as <i>E. Coli</i>)	We test for these organisms because they can indicate a problem with water quality. Where they are detected, it is often because they can grow within taps in the home. Follow-up samples are normally satisfactory.	0 per 100ml
Total coliforms		0 per 100ml (<i>indicator standard</i>)
Plate count at 37°C (colonies per ml) (<i>indicator standard</i>)	Small numbers of harmless bacteria are always likely to be present in the water: these tests measure the bacteria which will grow at 37°C or 22°C. The information is used to maintain the efficiency of the treatment process and water mains cleanliness.	Results are compared against a long-term average. Any abnormal change is investigated.
Plate count at 22°C (colonies per ml) (<i>indicator standard</i>)		
Enterococci (Faecal Streptococci)	As with coliforms, the presence of these organisms can indicate a problem with water quality, so we investigate if we find them.	0 per 100ml
Physical parameters		
Temperature	We check temperature when we take water samples, to monitor changes in the system.	No legal limit
Conductivity	By passing an electrical current through the water, we can measure the dissolved salts present.	2500 µS per cm (<i>indicator standard</i>)
pH : two standards apply, one is mandatory, the other is an indicator standard.	This is a measure of how acid or alkaline the water is. The water we supply is slightly alkaline.	> 6.5 and <10.0 (<i>Mandatory standard</i>) <9.5 (<i>indicator standard</i>)
Turbidity	This is a measurement of the cloudiness of the water, normally caused by suspended minerals.	4.0 NTU
Colour	Changes in the water source, or iron from water mains, can give a "tint" to the water.	20 mg/l Pt/Co
Taste Dilution number	Taste or odour in water can be measured by comparing the sample with a "standard" water.	Dilution number max. 3
Odour Dilution number		Dilution number max. 3
Chemical parameters and Groups		
Ammonium	Ammonia occurs naturally in many water sources. It is not harmful and is normally removed by water treatment.	0.5 mg/l NH ₄ (<i>indicator standard</i>)
Nitrate	Nitrate can be found at increased levels where water passes through agricultural land. Bristol Water works with the Environment Agency to try and resolve this.	50 mg/l NO ₃
Nitrite	Nitrite occurs in source water and can form where chloramine is used as the residual disinfectant in the mains network.	0.5 mg/l NO ₂
Chloride	Chloride occurs naturally in water but may give a "salty" taste at high levels.	250 mg/l (<i>indicator standard</i>)
Sodium	Sodium is a naturally occurring substance which can also be increased as an effect of softening the water.	200 mg/l

SUBSTANCE TESTED UNDER BRITISH LAW	WHAT IT MEANS	AMOUNT ALLOWED
Fluoride	Bristol Water has never added fluoride to any of the water supplied, although it is naturally present in all water at low levels.	1.5 mg/l
Total organic carbon <i>(indicator standard)</i>	TOC is a measure of the natural organic material present in water. It varies from source to source and is monitored to check for any unusual changes.	No abnormal change
Lead	Many properties built before the mid-1960's have a lead supply pipe or some lead plumbing. Bristol Water adds phosphate to most of the water supplied to reduce the amount of lead which dissolves from such pipes. If you have lead pipes and would like to check if they are causing a problem, we can test the water free of charge.	25 µg/l. In 2013 the standard will drop to 10 µg/l
Aluminium	Aluminium occurs naturally, although aluminium salts are also used at some of our treatment works to remove impurities from the water. Concerns have been expressed about links between aluminium and Alzheimer's disease, although research on this is ongoing and the connection remains unproven.	200 µg/l
Sulphate	Sulphate occurs naturally in water and comes from mineral deposits.	250 mg/l <i>(indicator standard)</i>
Copper	Copper comes from plumbing systems and can cause a metallic taste in the water at high levels.	2.0 mg/l
Iron	Iron can be present in some water sources and can enter drinking water from old iron water mains or domestic pipework. Whilst not a health hazard, this can cause a colour in the water.	200 µg/l
Manganese	Manganese comes from the water source. Although it is not a hazard to health, it can cause a colour in the water and staining in washing at high levels.	50 µg/l
Nickel	Occurs naturally in water at low levels and may come from plumbing.	20 µg/l
Benzene	Benzene comes from fuels such as petrol. It is removed by treatment and filtration.	1.0 µg/l
Total chlorine	Chlorine is an essential part of water treatment and prevents the growth of bacteria in the water mains network. Levels are kept as low as possible whilst ensuring the bacterial quality of the water remains high.	No legal limit
Arsenic	This occurs naturally in water at low levels. Where we have detected arsenic above the drinking water standard in water sources we have installed new treatment systems to remove it.	10 µg/l
Boron	Small amounts of boron can be found in some waters due to its use in detergents.	1.0 mg/l
Bromate	Bromate can form when ozone is used to treat water. We control the treatment process tightly to minimise this.	10 µg/l

SUBSTANCE TESTED UNDER BRITISH LAW	WHAT IT MEANS	AMOUNT ALLOWED
Antimony	These metals can occur naturally in source waters at low levels. Some may also come from plumbing systems.	5.0 µg/l
Cadmium		5.0 µg/l
Chromium		50 µg/l
Mercury		1.0 µg/l
Selenium		10 µg/l
Cyanide	This substance is rarely found in water. When it is, it is normally in areas with a lot of heavy industry.	50 µg/l
Trichloromethane	These compounds are known as trihalomethanes (THM's) or haloforms. They form when water is treated using chlorine.	Limit for the total amount detected of these four compounds is 100 µg/l
Dichlorobromomethane		
Dibromochloromethane		
Tribromomethane		
Tetrachloromethane (carbon tetrachloride)	These are solvents which arise as a result of industrial processes. They can however be removed easily by treatment.	3.0 µg/l
1,2 Dichloroethane		3.0 µg/l
Trichloroethene and Tetrachloroethene		Limit for the total amount detected of these two compounds is 10 µg/l
Benzo-a-pyrene	These compounds are all known as polycyclic aromatic hydrocarbons (PAH's) and can enter water where coal tar pitch was used in the past to line iron water mains, to prevent corrosion. Bristol Water has an ongoing programme to improve these water mains where they have been shown to cause PAH to enter the water.	10 ng/l
Benzo-b-fluoranthene		Limit for the total amount detected of these four compounds is 0.1 µg/l
Benzo-k-fluoranthene		
Benzo-ghi-perylene		
Indeno-123-cd-pyrene		
Pesticides		
Aldrin	The pesticides listed on the left have a lower limit (30 parts per trillion) than other pesticides.	30 ng/l
Dieldrin		30 ng/l
Heptachlor		30 ng/l
Heptachlor epoxide		30 ng/l
Other individual pesticides	Pesticides tested will vary from area to area: it is not appropriate to list here all the different pesticides used. DEFRA provide information on the pesticides used in the catchment area of each water source. This information is used to identify which pesticide might enter the water at each water source and the water is tested for these chemicals.	0.1 µg/l
Total pesticides	This is the total amount of pesticide detected in each water sample tested. It does not include results shown as "<" in the water quality summary, because this means that none of the pesticide was detected.	0.5 µg/l