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# National Database of Recreational Fresh Water Quality - Scoping Study

Centre for Research into Environmental Health

R&D Technical Report E9

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# National Database of Recreational Fresh Water Quality - Scoping Study

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R&D Technical Report E9

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TH-7/97-B-AZKH

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This scoping study provides information about the sources of microbiological data from recreational fresh water sites and specifies the location of the data, size of the datasets, storage media and availability. The report provides background information to staff involved in water quality matters who are interested in the compilation of the database. The database will be produced in due course as part of a further phase of this project.

**Research contractor**

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## **EXECUTIVE SUMMARY**

Local Authorities, Water Companies, Environment Agency Regions and a number of other organisations were approached to determine whether they hold information on the microbiological quality of fresh water recreational sites.

A total of 307 local authorities responded to the request for information, 79 of which conduct microbiological monitoring of fresh water recreational sites in their area. The majority of sampling and analysis was conducted according to standard methodology with the inclusion of quality control procedures. None of the local authorities would be unwilling to share their data with the Environment Agency (The Agency).

Midlands was the only Agency region routinely monitoring recreational fresh waters, although a number of other regions routinely monitor such waters, but distinctions are not made between recreational and non-recreational sites.

The majority of water companies do not monitor recreational sites, unless they are also used for drinking water abstraction.

Fresh water microbiological data were also held by the Institute of Hydrology, British Waterways and the Centre for Research into Environment and Health.

Data held in machine readable form can easily be transferred and compiled into a common format. Initial transfer of data held on hard copy is likely to be time consuming. The use of a specifically designed pro forma should facilitate routine updating.

The construction of a national database of recreational fresh water quality is both feasible and would constitute a valuable resource.





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# 1. INTRODUCTION

In the UK, there is currently no statutory duty to monitor fresh recreational waters. Monitoring of recreational water is restricted to those bathing waters identified under Directive 76/160/EEC, which are all coastal sites. In 1991, proposals for statutory water quality objectives were put forward (NRA, 1991), under which water quality targets were to be set according to the uses to which individual stretches of water are put, or are intended to be put. One of the proposed use classes was 'water contact activities'. The use class 'Watersports', in the government's response to the NRA proposals (DoE/WO, 1992) was not been given a high priority, and water quality standards for this use category are unlikely to be established without further epidemiological research. Legislation in this area, is therefore unlikely to change in the medium term as the proposed EU Ecology Directive (CEC, 1994) is also no longer expected to progress in its current form. However, recent developments include the WHO consideration of guidelines to recreational water quality and, at the European level, the proposed revision of the Bathing Water Directive, discussions surrounding the Framework Directive for Water and the deliberations of the EU Water Task Force. These European considerations may create an impetus for amendments to current Directives which could impact on this area of environmental control. At the time of writing (January 1997) these developments have yet to crystallise.

Despite the absence of statutory duty, a number of organisations hold data on the microbiology of recreational fresh waters. This information may be gathered, in response to local interest or concern or under the remit of other legislation, (e.g. the surface water directive or monitoring drinking water abstraction points) where water recreation also takes place.

The main objective of this scoping study was to establish which organisations hold data on the water quality of recreational fresh waters, the extent of the data and availability to the Environment Agency.



## **2. METHODOLOGY**

Questionnaires (Appendix A) were sent out to all organisations thought to hold recreational fresh water quality data. The questionnaire included questions on;

- details of any microbiological monitoring undertaken;
- the parameters monitored;
- the frequency of monitoring;
- methods of enumeration;
- quality control procedures;
- data storage;
- availability of data.

In addition to enquiring about monitoring conducted by the organisation in question, it was also established whether the organisation received water quality data from other sources.

In order to test data transfer potential, a range of organisations were approached and asked to provide data.



## 3. RESULTS

### 3.1 Local Authorities

Although there is no statutory duty on local authorities to monitor recreational waters, it was known that a number of environmental health departments around England and Wales do conduct monitoring. Indeed, the Chartered Institute of Environmental Health have produced a report addressing the issue of recreational water quality, namely "*The assessment of recreational water quality (fresh and sea water). A guide for decision makers in environmental health*" (Chartered Institute of Environmental Health, 1996), in order to provide guidance for environmental health officers.

Questionnaires on fresh water bacteriological monitoring policy were sent out to each of the 402 local authorities in England and Wales. A total of 307 (76.4%) local authorities responded. Of those, 79 (25%) monitored fresh recreational water themselves, whilst an additional 37 received information solely from other sources, principally the Agency. During the survey, a number of local authorities currently not examining recreational fresh waters expressed an interest in doing so.

Total coliforms and *E. coli* were the most commonly measured parameters, with 30cm below the surface being the most popular sampling depth. The majority of samples were analysed by the Public Health Laboratory Service (59.5%). Over 500 sites are monitored by local authorities. Full results are shown in Table 1. A list of the local authorities which conduct monitoring and details of the waters that they monitor is shown in Appendix B.





**Table 1 Local Authority Monitoring Questionnaire Results - continued**

---

• Are quality control procedures included during analysis?		Yes	57
		No	8
Sample analysis	PHLS		47
	Water Co.		6
	EA		1
	Other labs		11
	Not specified		12
• Are the data stored as hard copy?		Yes	62
• Are the data stored on computer?		Yes	26
If Yes please specify the software package	Lotus	Yes	3
	D Base	Yes	1
	Excel	Yes	5
	Other	Yes	15
• Are the data made available to:	The public	Yes	53
	Environmental Committee	Yes	54
	Other Agencies	Yes	41
• Would you be happy to share the data with the Environment Agency?		Yes	75
		No	0
If Yes could you supply the data as	ASCII file	Yes	7
	Hard Copy	Yes	57
	Data file of your choice	Yes	7
• Would a charge be made for the provision of the data?		Yes	15
		No	52
		?	8
• Do you obtain information on freshwater quality from any other source?		Yes	17

---

A total of 11 local authorities stated that Report 71 (HMSO, 1994) recommendations were not followed during sample analysis, and 8 local authorities reported that quality control procedures were not included during analysis. Excluding data collected not in accordance with Report 71 recommendations and/or analytical quality control procedures, would eliminate 16 local authorities.

## **3.2 Water Companies**

Modified questionnaires were sent out to the ten main water companies. All of the companies responded. The majority (80%) do not monitor recreational water quality. Wessex Water monitors ten sites used for both water supply and recreational purposes for total and faecal coliforms and colony count at 22°C. Yorkshire Water conducted a microbiological survey of water bodies in their region during 1988 and 1989, but monitoring is not carried out on a regular basis.

## **3.3 Environment Agency**

The Midlands region is the only Agency region which regularly and specifically monitors recreational fresh water quality, although the Northumbria and Yorkshire region conduct monitoring of the River Tees on behalf of the Teeside Development Corporation. Southern region conducted a large scale survey of its non-coastal recreational waters between May 1991 and October 1993. A total of 170 sites were examined, of which 78 were considered to be 'legitimate' recreational sites, other sites were considered to be 'non-legitimate' but were thought to be used for water recreation on an opportunistic basis. A number of other regions, namely Anglian, Thames and Welsh, volunteered that fresh water microbiological monitoring is conducted but distinctions are not made between recreational and non-recreational sites. A list of monitored waters is shown in Appendix C.

## **3.4 Public Health Laboratory Service**

The Public Health Laboratory Service (PHLS) analyse many of the water quality samples taken by local authorities, and much of their work in this field is conducted on a contract basis. There is, however, a 'Water Surveillance Group' within the PHLS and this group have conducted a preliminary study of microbiological parameters in eight, unspecified, inland

waters (Public Health Laboratory Service Water Surveillance Group, 1995). Recreational waters from Bristol, Guildford, Manchester, Newcastle-upon-Tyne, Reading, Swansea, Wolverhampton and Nottingham were sampled weekly for four weeks during July 1991.

### **3.5 Other Organisations**

Other organisations, such as the Institute of Hydrology and British Waterways were also approached.

#### **3.5.1 Institute of Hydrology**

The Institute of Hydrology holds a large amount of fresh water microbiological quality data on computer, including some dating back to 1978 allowing temporal changes to be examined, although it is not specifically related to recreational use. Sampling sites are listed in Appendix D.

#### **3.5.2 British Waterways**

British Waterways conducts occasional monitoring of a number of its canal sites around the country, although none is monitored on a routine basis. Samples are analysed by NAMAS accredited laboratories. Data are stored on computer in 'Excel', which could be made available to the Agency. Sampling sites are listed in Appendix D.

#### **3.5.3 Centre for Research into Environment and Health**

The Centre for Research into Environment and Health (CREH), as part of its research programme, holds microbiological data on a number of fresh water recreational sites conducted as intensive one off surveys. These sites include the River Trent, Afon Tryweryn, River Torridge, River Washburn, Oxford Canal, and the Staffordshire and Worcestershire Canal.

Additionally, data are held on Afon Rheidol and Afon Clywedog, although these sites are not thought to be used for water recreation.

## **4. DATA ACQUISITION AND TRANSFER**

Data held by organisations, other than local authorities, tend to be stored on computer. This should, therefore, with appropriate computing skills, be relatively easy to transfer and compile into a single database. Data, on computer diskette in a variety of different formats and programmes, were acquired from British Waterways ('Excel'), CREH ('Word' Macintosh) and Anglian region of the Agency ('Dbase') in order to test ease of transfer. In addition, data from Arun District Council (Lotus 123) and Swansea City Council (hard copy) were acquired.

Data were transferred into 'Excel' and sorted by water body, a three page extract of which is shown in Appendix E. Transfer of computer files and compilation of the 'Excel' database was relatively easy. Inclusion of data stored as hard copy was, however, time-consuming. The data received from Swansea City Council were in typed summary form. In some instances, however, it may be necessary to work from individual laboratory reports.

Initial data transfer is likely to be time-consuming as the majority of records held by local authorities are held only as hard copies. Where records are computerised, transfer is likely to be quick, easy and accurate. A pro forma (hard copy or software) needs to be developed for routine updating purposes, allowing comparable information to be recorded from all organisations; this would allow information to be recorded as hard copy or in machine-readable form and would facilitate data transfer.



## **5. DISCUSSION**

Although there is currently no statutory duty to monitor the microbiological quality of fresh water recreational sites, a number of organisations and local authorities do hold such data. Construction of a national database using the data available would provide a valuable resource which would enable gaps in monitoring to be identified. A number of local authorities commented that, although they currently conducted no monitoring, they were keen to implement monitoring schemes. Information derived from a national database would allow appropriate monitoring schemes to be designed.

Initial data transfer would be time-consuming as many records are held only as hard copy. Increasingly, however, many local authorities are storing records on computer. This would facilitate routine updating of the database covering the most recent analyses.

The majority of data is collected following standard procedures and with quality control systems in place. Where this is not the case, further information about systems used should be obtained prior to including or excluding data from the database.





## 6. CONCLUSIONS

- The report has demonstrated the feasibility of generating a national database of recreational fresh water quality.
- Benefits to the Agency could accrue from a readily accessible information source to facilitate advice on appropriate categories of use which might be requested by local authorities, public health agencies and recreational interest groups.
- At this stage, the overall cost of mounting such a system is unknown and the current non-statutory monitoring undertaken may not produce directly comparable data between sites.
- Considerable effort on sampling and analysis of recreational waters is currently undertaken by a number of local authorities, British Waterways and other organisations. This demonstrates the potential for cost sharing if a national body, such as the Environment Agency, wishes to provide co-ordination and scientific integration to ensure enhanced data comparability for inter-site comparison.
- It is possible that UK fresh water recreation sites may be considered for future identification under the terms of the Bathing Water Directive. In the event of such a development comparable and scientifically robust data describing each site would be essential.
- It is therefore recommended that the Environment Agency initiate central co-ordination and collation of data acquired on water quality at fresh water recreation sites. This will require liaison with other agencies to avoid duplication and maximise the utility of the water quality information. Long-term maintenance of such a database will be required

and it is recommended that this aspect be given full consideration during the initiation process.

## REFERENCES

CEC (1994) Proposal for a Council Directive on the ecological quality of water. COM(93) 680. 94/0152 (SYN).

Chartered Institute of Environmental Health (1996) The Assessment of Recreational Water Quality (Fresh and Sea Water). A Guide for Decision-Makers in Environmental Health. Chadwick House Group Ltd.

DoE/WO (1992) River Quality. The Government's Proposals: A Consultation Paper.

HMSO (1994) The bacteriological examination of drinking water supplies 1994. Methods for the examination of waters and associated materials. *Reports on Public Health and Medical Subjects No. 71.*

NRA (1991) Proposals for statutory water quality objectives. *Water Quality Series No. 5.*

Public Health Laboratory Service Water Surveillance Group (1995) Preliminary study of microbiological parameters in eight inland recreational waters. *Letters in Applied Microbiology* 21, 267-271.



# **APPENDIX A**

## **Example Questionnaire**

**Local Authority Freshwater Inventory Questionnaire**  
*Local Authority*

Please complete by circling answers and filling in the blanks.

- Do you monitor any freshwater sites within your region for microbiological parameters Yes    No

If <b>Yes</b> which parameters do you measure?	Total coliforms	Yes	No
	Faecal coliforms	Yes	No
	<i>E. coli</i>	Yes	No
	Faecal streptococci	Yes	No
	Others (please specify)	Yes	No

---

If **No**, please see final question (p 3)

- At what depth are the samples taken Surface    Yes    No  
30 cm        Yes    No  
Other (please specify)    Yes    No
- 

- Are samples kept cool prior to analysis? Yes    No  
If **Yes**, how are the samples cooled? Cool box    Yes    No  
Refrigerator    Yes    No  
Other (please specify)    Yes    No
- 

- Is analysis commenced within 6 hours of sampling? Yes    No

- Are quality control procedures included during sampling? Yes    No

- Are Report 71<sup>†</sup> recommendations followed during sample analysis Yes    No

- What method of enumeration is used? Total coliforms    MF    MPN  
Faecal coliforms    MF    MPN  
*E. coli*    MF    MPN  
Faecal streptococci    MF    MPN

---

<sup>†</sup> The Bacteriological Examination of Drinking Water Supplies 1994; Methods for the Examination of Waters and Associated Materials. Reports on Public Health and Medical Subjects No. 71. HMSO.

MF - Membrane Filtration

MPN - Most Probable Number

**Local Authority Freshwater Inventory Questionnaire - continued**  
*Local Authority*

- Are quality control procedures included during analysis? Yes    No

If **Yes** please supply details of a contact at the laboratory:

Name: \_\_\_\_\_

Address: \_\_\_\_\_

Telephone: \_\_\_\_\_

- At approximately how many sites are these parameters measured? \_\_\_\_\_

- Please list these sites and outline how frequently they are monitored (see over)

- Are the data stored as hard copy? Yes    No

- Are the data stored on computer? Yes    No

If **Yes** please specify the software package

Lotus	Yes	No
D Base	Yes	No
Excel	Yes	No
Other*	Yes	No

\* Please specify \_\_\_\_\_

- Are the data made available to:
 

The public	Yes	No
Environmental Committee	Yes	No
Other Agencies	Yes	No

- Would you be happy to share the data with the Environment Agency? Yes    No

If **Yes** could you supply the data as

ASCII file	Yes	No
Hard Copy	Yes	No
Data file of your choice*	Yes	No

\* Please specify \_\_\_\_\_

- Would a charge be made for the provision of the data? Yes    No

**Local Authority Freshwater Inventory Questionnaire - continued**  
*Local Authority*

- Do you obtain information on freshwater quality from any other source?      Yes    No

If Yes please list source and the type and extent of information obtained below

Source	Contact name/address	Information obtained
e.g. Local windsurfing club	Fred Krebs, Dibner Country Park, Dibner Lane Haslton DF2 9BJ.	Faecal coliforms, Total coliforms at Dibner Lake and Brereton Lake



**Local Authority Freshwater Inventory Questionnaire - continued**  
*Local Authority*

**List of Monitored Freshwater Sites**

Site	Approx. frequency of sampling	Type of water (S,R or L*)	Recreation†	
			Full Immersion	Non-Immersion
e.g. Cloverfields Pool	2 x year	L	X	✓

---

\* S - Stream R - River L - Lake

† Please tick to indicate whether the site is used for immersion and/or non-immersion recreation

## **APPENDIX B**

### **Local Authorities Conducting Recreational Fresh Water Monitoring**

BARKING and DAGENHAM  
EALING  
HACKNEY  
SUTTON  
BRADFORD CITY  
KIRKLEES  
SANDWELL  
WAKEFIELD CITY  
ADUR  
BLABY  
BRAINTREE  
BRIGHTON  
CASTLE POINT  
CHRISTCHURCH  
COLCHESTER  
CREWE AND NANTWICH  
DERBY CITY  
ELLESMERE PORT AND NESTON  
FOREST HEATH  
KENNET  
LANCASTER CITY  
MID BEDFORDSHIRE  
MOLE VALLEY  
NORWICH CITY  
PLYMOUTH CITY  
PURBECK  
ROCHESTER UPON MEDWAY  
SHEPWAY  
SOUTH KESTEVEN  
STAFFORD  
SUFFOLK COASTAL  
THREE RIVERS  
TONBRIDGE AND MALLING  
VALE ROYAL  
WEST LANCASHIRE  
CARDIFF  
OGWR  
RHYMNEY VALLEY  
SWANSEA CITY  
WREXHAM MAELOR

BROMLEY  
GREENWICH  
ISLINGTON  
TOWER HAMLETS  
DONCASTER  
OLDHAM  
SEFTON  
WIGAN  
ARUN  
BOURNEMOUTH  
BRECKLAND  
BRISTOL CITY  
CHELMSFORD  
CLEETHORPES  
COTSWOLD  
DARLINGTON  
EASTLEIGH  
EXETER CITY  
HOVE  
KING'S LYNN & WEST NORFOLK  
MALVERN HILLS  
MIDDLESBROUGH  
NORTH WARWICKSHIRE  
NOTTINGHAM CITY  
POOLE  
REDDITCH  
SELBY  
SOUTHAMPTON CITY  
SOUTH NORFOLK  
STAFFORDSHIRE MOORLANDS  
THAMESDOWN  
THURROCK  
TORRIDGE  
WAVERLEY  
WINDSOR & MAIDENHEAD ROYAL  
CEREDIGION  
PRESELI PEMBROKESHIRE  
SOUTH PEMBROKESHIRE  
VALE OF GLAMORGAN

## Local Authority Fresh Recreational Water Monitoring Sites

Local Authority	Monitored Site	Frequency
<b>BARKING and DAGENHAM</b>	Mayesbrook Boating Lake	12
	Mayesbrook Angling Lake	1
	Wantz Lake	1
	Eastbrook Lake	1
	Parsloes Park Lake	1
	Barking Park Lake	1
<b>BROMLEY</b>	River Cray	
	River Kydbrook	
	River Beck	
	River Pool	
	River Ravensbourne	
<b>EALING</b>	Brent Cres. Ind. Est.	6
	Gurnell Bridge	6
	Costons Bridge	6
	Greenford Bridge	6
	Hanwell Bridge	6
<b>GREENWICH</b>	River Plum	
	River Shuttle	
	River Quaggie	
	Thamesmere	
	South Mere	
<b>HACKNEY</b>	Leabridge Weir	
	Springfield	
	Carpenters Road	
<b>ISLINGTON</b>	Regents Canal	1
<b>SUTTON</b>	Beddington Park Boating Lake	12
<b>TOWER HAMLETS</b>	Blackwall Basin	4
	Millwall Docks	4
	Canary Wharf/West India Docks	4
	River Lea	4
	Shadwell Basin	4
	Limehouse Basin	4
	Spirit Quay	4
	St. Katherines Dock	4
	Limehouse Cut	4
	Regents Canal	4
	Victoria Park Lake	4
	Hertford Union Canal	4
<b>BRADFORD CITY</b>	Shibden Brook	
	Royds Hall Beck	
	Toadholes Beck	
	Low Moor Beck	
	High Royds Beck	
	Bradford Beck	
Pudsey Beck		

	Tong Beck	
	Carr Beck	
	Leeds/Liverpool Canal	
	River Aire	
	Cliff Dyke	
	Red Beck	
	Middle Brook	
	Clayton Beck	
	Pinch Beck	
	Pitty Beck	
	Redburn Beck	
	River Wharfe	
	North Beck	
	River Worth	
	Bridgehouse Beck	
	Eastburn Beck	
	Silsden Beck	
<b>DONCASTER</b>	Barnby Dunn Lake	6
<b>KIRKLEES</b>	Spennithorne River	4
<b>OLDHAM</b>	Alexandra Park Lake	4
<b>SANDWELL</b>	Birmingham Canal	4
	Swan Pool	4
	Forge Pool	4
<b>SEFTON</b>	Sands Lake	2
	Hesketh Park Lake	5
	Botanic Gardens Lake	4
	Fountain (Lord Street)	1
	Leeds/Liverpool Canal	4
<b>WAKEFIELD CITY</b>	Pugneys Lake	12
	Hemsworth Water Park	12
	Winterset Reservoir	12
	Horbury Lagoon	12
<b>WIGAN</b>	Pennington Flash	4
	Three Sisters, Ashton	4
	Orrell Water Park	4
	Scotmans Flash, Wigan	4
<b>ADUR</b>	River Adur	12
<b>ARUN</b>	River Arun	
	Lidsey Rife	
	Pagham Rife	
	Aldingbourne Rife	
	Patching Pond	
	Ferring Rife	
	Clapham Ditch	
	Mewsbrook Park	
	Oyster Pond	
	Middleton Pond	
	Swanbourne Lake	
	Walberton Pond	

	Pryors Lane	
	Slindon Pond	
	Hotham Park	
	Black Ditch	
<b>BLABY</b>	Blaby Ford	3
	Frolsworth Brook	3
	Thurlaston Brook	3
	Stoney Cove	1
<b>BOURNEMOUTH</b>	Bourne Stream	22-36
	Kinson Brook	12
<b>BRAINTREE</b>		
<b>BRECKLAND</b>	E. Harling Bridge	2
	Thetford Bridge	2
	Thetford, Abbey Farm	2
	Thetford (River Tuet)	2
	Thetford (River Lt. Ouse)	2
	Lyng Sparham Mill	2
	Swanton Marley	2
	Worthing Pit	2
	Worthing Bridge	2
<b>BRIGHTON</b>		
<b>BRISTOL CITY</b>	Avonmouth Rhine	12
	River Trym	12
	Collitois Brook	12
	Crox Bottom	12
	The Malago	12
	Bushington Brook	12
	St. Georges Park Lake	12
	Coombe Brook	12
	Eastrille Park Lake	12
	River Frome	12
	Horfield Brook	12
	River Avon	12
<b>CASTLE POINT</b>	River Thames	12
<b>CHELMSFORD</b>	River Chelmor	1
	River Crouch	1
	River Can	1
	Little Baddow	1
	Central Park Lake	1
	Channels Watersports Club	1
	Danbury Country Park	1
	Boreham Mere	1
	Saltcoates Lake	1
	Skreens Park	1
	Eves Corner Lake	1
<b>CHRISTCHURCH</b>		
<b>CLEETHORPES</b>		

<b>COLCHESTER</b>	River Stour	1
	Dedham Mill Tail	1
	River Colne	1
	Roman River	1
<b>COTSWOLD</b>	Keynes Park	varies
	South Cerney	2-3
<b>CREWE AND NANTWICH</b>	Leighton Brook	2
	Wistasten Brook	2
	Valley Brook	2
<b>DARLINGTON</b>	Broken Scar	4
	Middleton Water Park	4
<b>DERBY CITY</b>	Alvaston Lake	2
	Markeaton Lake	2
	Allestree Lake	2
	River Derwent	2
<b>EASTLEIGH</b>	River Itchen	10
	Lakeside	10
	Botley Mill	10
	River Hamble	10
<b>ELLESMERE PORT AND NESTON</b>	Ellesmere Port Lower Basin	12
	Manchester Ship Canal	
<b>EXETER CITY</b>		
<b>FOREST HEATH</b>	River Lark	10
	River Little Ouse	10
<b>HOVE</b>	Hove Lagoon	1
<b>KENNET</b>	River Kennet	
<b>KING'S LYNN &amp; WEST NORFOLK</b>	River Nar	9
	River Wissey	5
	Cut Off Channel, Hilgay	5
	River Little Ouse	5
	River Ouse	4 - 5
	Leziate Lakes	3
	Snettisham Lakes	2
<b>LANCASTER CITY</b>		
<b>MALVERN HILLS</b>	Gullet Quarry	
<b>MID BEDFORDSHIRE</b>	Stewartby Lake	
	Brogborough Lake	
<b>MIDDLESBROUGH</b>	Hemlington Lake	12
<b>MOLE VALLEY</b>	River Mole	1
<b>NORTH WARWICKSHIRE</b>	Hemlingford Water	5
	Bodmoor Heath Water	5

	Mill Pool	2
<b>NORWICH CITY</b>	Lakenham Cock	12 - 14
	Wensum Park	12 - 14
	Dolphin Bridge	12 - 14
	Hellesdon Mill	12 - 14
	Earlham Park	12 - 14
<b>NOTTINGHAM CITY</b>	Colwick Park Lake	16
<b>PLYMOUTH CITY</b>	River Plym	12
<b>POOLE</b>	Ham Common Lake	12
	Creekmoor Upper Lake	12
	Creekmoor Lower Lake	12
	Hatch Pond Lake	12
	River Stour	12
	Alderney Sports Field Pond	12
	Alder Road Bottom Pond	12
	Alder Hills Nature Reserve	12
	Coy Pond Stream	12
<b>PURBECK</b>		
<b>REDDITCH</b>	Arrow Valley Lake	1
<b>ROCHESTER UPON MEDWAY</b>	River Medway	12 - 16
	Cliffe Lake	4
	Mast Pond	4
	Capstone Park Lake	4
<b>SELBY</b>	University Lake	12
<b>SHEPWAY</b>	Hythe Canal	
	Seabrook Stream	
	Mill Lees Stream	
<b>SOUTHAMPTON CITY</b>	River Itchen	
<b>SOUTH KESTEVEN</b>	Tallington Lakes	one off
<b>SOUTH NORFOLK</b>	Costessey Pits infrequently	
	Broome Lakes infrequently	
<b>STAFFORD</b>	River Trent	
	River Sow	
	River Penk	
<b>STAFFORDSHIRE MOORLANDS</b>		
<b>SUFFOLK COASTAL</b>		
<b>THAMESDOWN</b>	Coate Water	6
<b>THREE RIVERS</b>	Batchworth lake	8
	Bury Lake	

	Stockers Lake	
<b>THURROCK</b>	Mardyke	13
	Grangewaters	13
	Aveley Lake	2
	Mollands Lake	2
	Marley A.C.	2
	Arena Essex Lake	2
	Lillside Lion Quarry	2
	Bulphan Fisheries	2
	Woodies Lake	2
	The Warren	2
	Shell A.C.	2
	Leisure Sport	2
	Grange Farm	3
	Lakeside Recreational Lake	3
<b>TONBRIDGE AND MALLING</b>	Brooklands Lake	4
	Barden Lake	4
	Hayesden Lake	4
	Leybourne Lake	4
<b>TORRIDGE</b>	River Torridge	5
<b>VALE ROYAL</b>	Manley Water Park	2
	Hatchmere Lake	2
	River Weaver	2
	Boundary Lake	2
	Pickmere Lake	2
	Winsford Flash	2
	Great Budworth Mere	2
<b>WAVERLEY</b>	Frensham Great Pond	12
	Frensham Little Pond	12
<b>WEST LANCASHIRE</b>		
<b>WINDSOR &amp; MAIDENHEAD ROYAL</b>		
<b>ARFON</b> only	Llyn Padarn	1991
<b>CARDIFF</b>	Roath Park Lake	
	St. Mellons Lake	
	Pentwyn Lake	
	Llanishen Reservoir	
	River Rhymney	
	River Taff	
	Bute East Dock	
<b>CEREDIGION</b>	Leri	
	Clerach	
	Rheidol	
	Ysthwyth	
	Gilwen	
	Howni	
	Hawen	
	Penbryn	



	Cwmlydn	
	Mwnt	
	Llanhyshrd	
	Llanon	
	Llansenfraid	
	Aeron	
	Gilfech	
<b>OGWR</b>	Kenft Pool	1
	Blaengarw Lakes	1
<b>PRESELI PEMBROKESHIRE</b>	River Nevern	3
<b>RHYMNEY VALLEY</b>	Darren Valley Lakes	12
<b>SOUTH PEMBROKESHIRE</b>		
<b>SWANSEA CITY</b>	River Tawe	2
	Oxwich Marsh	2
	Burry Pill	2
	Crofty Stream	2
	Parkmill Stream	2
<b>VALE OF GLAMORGAN</b>	Cosmeston Lakes	6
<b>WREXHAM MAELOR</b>	Strynt Las	12
	Hanmer Mere	12
	Moss Valley Lakes	12
	Acton Park Lake	12
	Gresford Flash	12
	Gresford Pond	12

## APPENDIX C

### List of Fresh Water Sites Monitored by Agency Regions

#### ANGLIAN

Monitored under the  
Surface Water Directive

Alton Water  
Abberton Reservoir  
Ardleigh Reservoir  
River Blackwater  
River Chelmer  
River Stour  
Hanningfield Reservoir  
Grafham Reservoir  
River Ouse  
River Wissey  
Stoke Ferry Cut-Off Channel  
River Nar  
River Ancholme  
Crangle Beck  
River Wit  
Covenham Reservoir  
Cadney Reservoir  
River Bure  
River Wavney  
River Wensum  
Costessey Pits  
Fritton Lakes  
Lound Mill Water  
Ormesby Broad  
Hollowell Reservoir  
Pitsford Reservoir  
Ravensthorpe Reservoir  
Rutland Water

#### NORTHUMBRIA & YORKSHIRE

Monitored under contract

River Tees

#### MIDLANDS

EC Directive monitoring

River Lathkill  
River Trent  
River Tame

Recreational sites

Colwick Park Lakes  
River Derwent  
Kingsmill Reservoir  
River Trent  
Grand Union Canal  
Holme Pierrepont Rowing Course  
Holme Pierrepont Canoe Slalom Course  
River Leam  
Oxford Canal  
River Soar  
Education Lake, Wanlip  
King Lears Lake  
Northern Lake  
River Arrow

Forgemill Lake  
Bodmoor Heath Water  
Hemlingford Lake  
Lea Marston Lakes  
Swanpool  
River Avon  
Cannop Brook  
Gloucester Sharpness Canal  
River Severn  
Stratford Canal  
River Dove  
Rudyard Lake  
Trent and Mersey Canal  
Westport Lake  
Calf Heath Reservoir  
Chasewater  
Gailey Reservoir  
Staffs Worcs Canal  
Bomere Lake  
Colemere Lake  
White Mere Lake  
River Vyrnwy  
River Clywedog  
River Teme  
Betton Pool

## **SOUTHERN**

River Test  
River Itchen  
River Lymington  
River Meon  
Charlton Lake  
Anton Lake  
Lakeside  
Cockle Pond  
Mill Pond  
Wire Mill Lake  
Hedge Court Lake  
River Arun  
River Adur  
Chichester Canal  
Aldingbourne Rife  
Ivy Lake  
Church Farm Lake  
Pagham Lagoon  
Southwater Co. Park  
Ardingly Reservoir  
River Ouse  
River Cuckmere  
Hove Lagoon  
Piddinghoe Lake  
Weir Wood Reservoir  
Egerton Park  
Castle Point  
Northpoint Beach  
River Medway  
River Stour  
Royal Mil. Canal  
Lydd Lakes

The Long Pits  
Nickolls Pits  
Kearsney Abbey Lake  
North Lake  
Bartons Point  
Bough Beach Reservoir  
Chipstead Lake  
Brooklands Lake  
Hayesden Lake  
Barden Lake  
Bewl Lake  
Hall Aggregates Lake  
Snodland Lake  
Blue Circle Lake  
Mote Park Lake  
Danson Park  
Westbere Lake

**THAMES**

Sites not specified

**WELSH**

River Loughar  
River Teifi  
River Neath

## APPENDIX D

### Sites for which data are held by the Institute of Hydrology

River Axe	River Exe
River Teign	River Tamar
River Torridge	River Duddon
River Dee	River Dane
River Eden	River Thames
Foudry Brook	River Balquhider
Gloucester Docks	North Tyne
South Tyne	River Tyne
River Severn	River Trent
Llyn Aled	Llyn Aled Isaf
Llyn Tegid	Trefnant Brook
Marchwiell Reservoir	River Dee
Vivod Stream	Pendinas Reservoir
Llyncyfynwy Reservoir	Nant-y-Ffrith
Afon Alwen	Brithdir Mawr Reservoir
Cilcain Reservoirs	Dolwen Reservoir
Plas Uchaf Reservoirs	Clywedog Reservoir
Fynnon Asaph Stream	Alwen Reservoir
Llyn Brenig	Cwmavon Reservoir
Usk Reservoir	Afon Cleddau
Afon Solva	Afon Teifi
Afon Tywi	Afon Usk
Afon Wye	Afon Conwy
Afon Dwyfor	Afon Dyfi
Afon Dysynni	Afon Glaslyn
Afon Gwrl	Afon Gwyfri
Afon Mawddach	Afon Seiont

### Sites for which microbiological data are held by British Waterways

Birmingham Canal Navigations	Gloucester Docks
Southfield Reservoir	Grand Union Canal
Regents Canal	Kennet & Avon Canal
Lee and Stort Navigations	Staffs & Worcs Canal
River Soar Navigation	Gloucester & Sharpness Canal
Brecon & Monmouth Canal	River Severn Navigation
Ashton Canal	Leeds & Liverpool Canal
Llangollen Canal	Shropshire Union Canal
River Trent Navigation	River Witham Navigation
Stratford Canal	Oxford Canal
Trent & Mersey Canal	

## **APPENDIX E**

### **Extract from 'Excel' database**

TC - total coliforms 100ml<sup>-1</sup>

FC - faecal coliforms 100 ml<sup>-1</sup>

FS - faecal streptococci 100ml<sup>-1</sup>

d/s - downstream

u/s - upstream

Water	Site	Date	Time	TC	FC	FS	Data Owned By
Aire & Calder Canal	Pollington	02-Feb-94		6000	1500		British Waterways
Aire & Calder Canal	Pollington	16-Feb-94		1500	1500		British Waterways
Aire & Calder Canal	Pollington	02-Mar-94		750	300		British Waterways
Aire & Calder Canal	Pollington	16-Mar-94		50	50		British Waterways
Aire & Calder Canal	Pollington	30-Mar-94		25	25		British Waterways
Aldingbourne Rife	Brooks Lane	30-Sep-93		5000	2000		Arun District Council
Aldingbourne Rife	Cricket Ground	30-Sep-93		30000	20000		Arun District Council
Arun (River)	Arundel Bridge	04-Sep-91		7000	3000		Arun District Council
Arun (River)	Arundel Bridge	16-Oct-91		2700	1620		Arun District Council
Arun (River)	Arundel Bridge	28-Jul-92		10000	0		Arun District Council
Arun (River)	Bognor Road Bridge	07-Aug-91		300	60		Arun District Council
Arun (River)	Bognor Road Bridge	06-Nov-91		400	200		Arun District Council
Arun (River)	Bognor Road Bridge	22-Apr-92		1500	300		Arun District Council
Arun (River)	Houghton	06-Nov-91		4500	1800		Arun District Council
Arun (River)	Houghton	28-Jul-92		1600	960		Arun District Council
Arun (River)	Mouth	07-Aug-91		140	56		Arun District Council
Arun (River)	Mouth	16-Oct-91		3500	1400		Arun District Council
Arun (River)	Rudford Ind. Est.	04-Sep-91		2500	0		Arun District Council
Arun (River)	Rudford Ind. Est.	06-Nov-91		400	0		Arun District Council
Arun (River)	Ship & Anchor	12-Feb-92		22000	4400		Arun District Council
Arun (River)	Ship & Anchor (d/s)	10-Oct-91		50000	20000		Arun District Council
Arun (River)	Ship & Anchor (d/s)	24-Sep-92		15	9		Arun District Council
Arun (River)	Ship & Anchor (u/s)	10-Oct-91		3000	1500		Arun District Council
Arun (River)	Ship & Anchor (u/s)	24-Sep-92		12	12		Arun District Council
Ashton Canal	I Manchester	13-Sep-93		11600	2400	240	British Waterways
Ashton Canal	I Manchester	24-Sep-93		940	460	89	British Waterways
Ashton Canal	I Manchester	13-Oct-93		1800	800	170	British Waterways
Ashton Canal	I Manchester	20-Oct-93		8000	2000	190	British Waterways
Ashton Canal	I Manchester	11-Nov-93		940	175	197	British Waterways
Ashton Canal	I Manchester	06-Dec-93		1260	1210	59	British Waterways
Ashton Canal	I Manchester	06-Jan-94		1400	275	360	British Waterways
Ashton Canal	I Manchester	14-Jan-94		1000	200	132	British Waterways
Ashton Canal	I Manchester	26-Jan-94		19000	1200	230	British Waterways
Ashton Canal	I Manchester	01-Mar-94		12600	8400	890	British Waterways
Ashton Canal	I Manchester	29-Mar-94		1460	330	102	British Waterways

Water	Site	Date	Time	TC	FC	FS	Data Owned By
Stratford Canal	A46 Bridge, Stratford	11-May-93		830	450	29	British Waterways
Stratford Canal	A46 Bridge, Stratford	21-Jul-93		4000	220	170	British Waterways
Stratford Canal	A46 Bridge, Stratford	10-Nov-93		340	230	420	British Waterways
Stratford Canal	A46 Bridge, Stratford	21-Dec-93		2900	440	150	British Waterways
Stratford Canal	A46 Bridge, Stratford	22-Feb-94		10	10	2	British Waterways
Stratford Canal	A46 Bridge, Stratford	18-May-94		150	100	12	British Waterways
Stratford Canal	A46 Bridge, Stratford	20-Jul-94		304	67	23	British Waterways
Stratford Canal	A46 Bridge, Stratford	09-Nov-94		700	460	1160	British Waterways
Tawe (River)	Landore	18.11.91	06:18	93000	7200	1100	Swansea City Council
Tawe (River)	Landore	18.11.91	07:18	30000	5400	2500	Swansea City Council
Tawe (River)	Landore	18.11.91	08:18	30000	8400	2800	Swansea City Council
Tawe (River)	Landore	18.11.91	09:18	140000	8400	3200	Swansea City Council
Tawe (River)	Landore	18.11.91	10:18	140000	10000	4600	Swansea City Council
Tawe (River)	Landore	18.11.91	11:18	150000	14000	3100	Swansea City Council
Tawe (River)	Landore	18.11.91	12:18	140000	9600	2100	Swansea City Council
Tawe (River)	Landore	18.11.91	13:18	50000	4800	1700	Swansea City Council
Tawe (River)	Landore	18.11.91	14:18	150000	12000	4300	Swansea City Council
Tawe (River)	Landore	18.11.91	15:18	50000	8400	2900	Swansea City Council
Tawe (River)	Landore	18.11.91	16:18	40000	11000	28000	Swansea City Council
Tawe (River)	Landore	18.11.91	17:18	20000	200	3400	Swansea City Council
Tawe (River)	Landore	18.11.91	18:18	60000	13000	3000	Swansea City Council
Tawe (River)	Landore	26.11.91	06:00	10000	8000	4800	Swansea City Council
Tawe (River)	Landore	26.11.91	07:00	10000	5600	3800	Swansea City Council
Tawe (River)	Landore	26.11.91	08:00	12000	5300	2400	Swansea City Council
Tawe (River)	Landore	26.11.91	09:00	20000	1700	2800	Swansea City Council
Tawe (River)	Landore	26.11.91	10:00	12000	3700	7200	Swansea City Council
Tawe (River)	Landore	26.11.91	11:00	12000	3200	1700	Swansea City Council
Tawe (River)	Landore	26.11.91	12:00	10000	2700	2000	Swansea City Council
Tawe (River)	Landore	26.11.91	13:00	15000	2700	1500	Swansea City Council
Tawe (River)	Landore	26.11.91	14:00	14000	5000	1000	Swansea City Council
Tawe (River)	Landore	26.11.91	15:00	6500	3500	1300	Swansea City Council
Tawe (River)	Landore	26.11.91	16:00	13000	3300	900	Swansea City Council
Tawe (River)	Landore	26.11.91	17:00	12000	3800	1300	Swansea City Council
Tawe (River)	Landore	26.11.91	18:00	19000	2400	1400	Swansea City Council
Tawe (River)	Landore	11.11.91		470000	110000	2300	Swansea City Council



Water	Site	Date	Time	TC	FC	FS	Data Owned By
New Junction Canal	Sykehouse	02-Mar-94		750	150		British Waterways
New Junction Canal	Sykehouse	16-Mar-94		100	25		British Waterways
New Junction Canal	Sykehouse	30-Mar-94		150	50		British Waterways
Ouse (River)	Offord Intake	01/03/94	12:00				Anglian NRA
Ouse (River)	Offord Intake	31/05/94	12:15	8900	4000	700	Anglian NRA
Ouse (River)	Offord Intake	22/08/94	11:30	20000	4200	50	Anglian NRA
Ouse (River)	Offord Intake	21/11/94	12:35	20000	4700	510	Anglian NRA
Ouse (River)	Offord Intake	27/02/95	10:30	12200	2100	600	Anglian NRA
Ouse (River)	Offord Intake	30/05/95	10:40	2400	320	90	Anglian NRA
Ouse (River)	Offord Intake	21/08/95	11:00	1400	350		Anglian NRA
Ouse (River)	Offord Intake	20/11/95	10:10	12500	1300	260	Anglian NRA
Oxford Canal	Coventry Bridge, Napton	15-Jul-92		1500	1180	215	British Waterways
Oxford Canal	Coventry Bridge, Napton	14-Sep-92		1180	480	162	British Waterways
Oxford Canal	Coventry Bridge, Napton	10-Nov-92		3040	1760	1410	British Waterways
Oxford Canal	Coventry Bridge, Napton	12-Jan-93		3600	238	130	British Waterways
Oxford Canal	Coventry Bridge, Napton	24-Mar-93		300	200	340	British Waterways
Oxford Canal	Coventry Bridge, Napton	25-May-93		1540	420	10	British Waterways
Oxford Canal	Coventry Bridge, Napton	28-Jul-93		1780	560	1	British Waterways
Oxford Canal	Coventry Bridge, Napton	05-Oct-93		1100	340	43	British Waterways
Oxford Canal	Coventry Bridge, Napton	08-Mar-94		600	40	20	British Waterways
Oxford Canal	Coventry Bridge, Napton	23-May-94		1000	360	106	British Waterways
Oxford Canal	Coventry Bridge, Napton	09-Aug-94		4300	230	77	British Waterways
Oxford Canal	Coventry Bridge, Napton	17-Oct-94		3400	220	78	British Waterways
Pagham Rife	d/s	02-Sep-93		500000	150000		Arun District Council
Pagham Rife	d/s	30-Sep-93		30000	20000		Arun District Council
Pagham Rife	d/s	16-Dec-93		160000	160000		Arun District Council
Pagham Rife	d/s	31-Jul-95		5000	5000		Arun District Council
Pagham Rife	d/s	21-Jul-95		5000	2600		Arun District Council
Pagham Rife	u/s	02-Sep-93		500000	400000		Arun District Council
Pagham Rife	u/s	16-Dec-93		2000	1600		Arun District Council
Pagham Rife	u/s	31-Jul-95		3000	1600		Arun District Council
Pagham Rife	u/s	21-Jul-95		280	200		Arun District Council
Regents Canal	f Camden	03-Sep-93		940	260	490	British Waterways
Regents Canal	f Camden	16-Sep-93		1600	600	330	British Waterways
Regents Canal	f Camden	07-Oct-93		1900	1700	460	British Waterways

