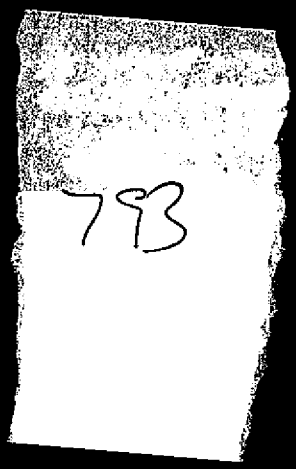

Science Connections Limited, Cranmore House, Market Cross, Malmesbury, Wiltshire SN16 9AS
Tel: (01666) 825239 Fax: (01666) 825245

DEPARTMENT OF THE ENVIRONMENT
DRINKING WATER INSPECTORATE

REPORT ON AN EVALUATION OF THE WATER QUALITY AND HEALTH RESEARCH PROGRAMME

MALMESBURY
WILTSHIRE

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Registered in England No. 2375352 at the above address

CONTENTS

EXECUTIVE SUMMARY

- An evaluation of the Water Quality and Health Research Sub-Programme was undertaken covering the period 1987-95 in which 88 projects had been identified as candidates for assessment. Sixty-one of these projects were evaluated. Just over half had been undertaken by one contractor, the Water Research Centre.

- A review team of four examined the science and its context under three headings, namely quality of research, usefulness of research, and value for money, and scored an identified range of features under each of these headings for performance. This exercise was undertaken as a result of a systematic examination of files and reports. In addition, around 20 interviews were held, using a structured format and mainly face-to-face, with key individuals representing both public and private sector organisations relevant to research on drinking water.

- Information retrieved as a result of desk examination of files and reports and from interviews was collated. It is presented in the report (Section 4) distinct from the analysis and identification of key issues and recommended action determined by the review team (Sections 5 and 6). A ROAME statement was drafted for the future operation of the research sub-programme (Appendix 8).

- Although the objectives of the research programme were redefined in 1993, further effort is needed in order to **articulate the rationale of the programme** clearly (4.1.3, 5.1.1, 6.3.1). There is ambiguity, particularly outside government, as to **whether the research programme underpins the remit of DWI or whether it is simply operated by DWI** in response to policy needs of the Water Directorate in DOE (4.1.3, 4.1.4, 5.1.2, 6.2.2, 6.3.1). It would be preferable if the interface between policy requirements and regulation was addressed and defined only within the Inspectorate itself rather than through the research programme.

- The policy position of the research programme and hence its rationale is further complicated as a result of the **range of interfaces on drinking water issues** with

other government departments, privatised companies, and the requirements of the European directives (4.1.10, 4.1.11, 4.2, 4.3.1, 5.2, 6.2). **These interfaces need clarification** which itself depends on establishing a clear rationale for the programme setting out its positioning in terms of a **policy statement** and **defining a strategy** that the research programme should use (5.1.1, 5.2.1, 6.2, 6.3, 7.7). One underlying theme germane to the programme's rationale is that of **risk assessment** (6.3.5).

- Continuing **decline in funding of drinking water research underpinning regulation sits uncomfortably with increasing R&D spend by large privatised operators**. There is a danger that such operators will increasingly set the agenda as a consequence. This imbalance must be addressed. One way of achieving this is to **increase the extent of collaborative research** in particular with the privatised sector, which is now more receptive to this approach, with other government departments that are stakeholders in drinking water issues, and through **European funding where current activity is marginal** (4.2.2, 5.4.7, 6.4.8, 7.4).

- Collaborating organisations will have different agendas and the roles of the partners will need to be clearly defined. However the **principle of "need to know"** should be sufficient to stimulate collaborative research of benefit to all parties. As the need for certain aspects of the research has its origins in European directives it is only logical to maximise effort fulfilling those needs on a European basis (5.3.1, 7.6). Some well focussed market research on what is possible here would be valuable. At present, there has been more success collaboratively overseas with North America (4.3.7).

- The scientific work undertaken over the period under review represents **a sound body of good quality scientific and technical knowledge**. It is not especially exciting or innovative, though there are exceptions, but this is to be expected in a research programme of this type (4.4.2, 5.4.1. 6.1.1, 7.1). In aggregate, the programme represents **a collection of projects of a tactical nature** rather than the fulfilment of an overarching strategy defined at the outset. **There is a need for some strategic research dimension** and a start should be made in defining it, if necessary by using external consultants (4.4.12, 4.4.16, 5.4.4, 7.9).

- To the credit of those involved a needs-driven culture is now established within the research programme (4.1.9, 5.5.4). **Appraisal procedures are evolving** particularly as needs are addressed through a wider portfolio of input (4.5.6). However, **the definition of what is required from the organisations involved could be improved** (4.5.3, 5.4.8, 5.4.9, 5.5.4, 6.1.6, 7.3). Competitive tendering is now the norm in implementation of projects in welcome contrast to the use of Programme Item Forms (PIFs) prior to 1993 (4.1.8, 4.1.9). The argument that centres of excellence are sacrificed through the use of such competitive tendering was not endorsed by the review team (4.4.9, 5.4.3).

- The **management has improved markedly since 1993** (4.5.3, 5.5.2). However, some **administrative procedures could still be improved** and these are identified (7.2). The **programme could be marketed more effectively** to create better awareness and corporate identity for the research programme as a whole.(5.6.2).

- **Dissemination and impact evaluation in relation to the research programme is still weak** and too passive in nature (4.6.6, 5.6, 6.1.7, 7.5). A number of suggestions are made for its improvement (5.6). Studies both on impact and improved dissemination procedures to be implemented by external contractors were recommended. These would improve overall awareness of the research programme and recognition of its effectiveness by those involved in the drinking water sector and more widely (6.4.11).

- Key specific actions RECOMMENDED include:

  - **Producing a research policy statement dealing with the rationale of the Water Quality and Health Research Programme.**

  - **Stating clearly the aims and objectives for the research Programme and outlining its operational characteristics.**

  - **Producing clear guidelines on the appraisal of the Programme.**

- **Improving administration by: databasing projects; producing a tabulation of completed, current and new projects; devising a file project schedule containing basic information that stays on file with a project from proposal stage until final outputs on completion; specifying a format for reports and other communication products that give a corporate identity to DWI.**

- **Improving dissemination and uptake aspects of the Programme using outside contractors to resource responsibilities such as: use of a corporate style for research reports; a circulated listing of such reports; a half-yearly newsletter; holding an annual and more targetted workshops; use of the Internet; and the provision of reports and executive summaries of reports.**

- **Commissioning a study on the impact of a range of research outputs.**

- **Commissioning a study on likely strategic research needs.**

- **Renaming the programme as the Drinking Water Research Programme with the newly adopted ROAME statement provided in this evaluation study.**

1. THE TASK

1.1 Specification of the Work and its Terms of Reference

1.1.1 The Department required an assessment of the Water Quality and Health Research Programme covering the period 1987 - 1995. The evaluation had to:

- focus on comparing research subjects with policy objectives and questions;
- examine the technical quality of research work and the extent to which objectives were met; and
- establish whether value for money had been achieved.

1.1.2 The objectives of the Water Quality and Health Research Programme were amended in 1993. Before this, the Area E Programme was divided into six arbitrary project areas:

- health risks from organic micropollutants in drinking water (E1);
- requirements of the EC Drinking Water Directive (E2);
- inorganic constituents of drinking water in relation to health (E3);
- microbial contamination - assessment and treatment (E4);
- methods of assessing water quality and health risks (E5); and
- groundwater (E6).

Groundwater research was transferred to the National Rivers Authority and sub-sections E1 and E3 were later combined as Health Risks and Micropollutants.

Since 1993 the objectives of the Water Quality and Health Research Programme (Area E) have been replaced by subject headings which more closely reflect current policy concerns. These are:

- regulatory obligations (European);
- regulatory obligations (National);
- support for European standards work;
- fundamental research.

The detailed objectives, both pre and post 1993, are set out in Appendix 1.

1.1.3 The objectives of the required evaluation of the Water Quality and Health Research Programme in respect of research contracts completed during the period 1987 - 1995 were specified in the following way:

- to determine whether the aims of the programme were appropriate to the responsibilities and policy objectives of the Department;
- to assess the technical quality of research undertaken for the Department;
- to establish and compare the performance of contractors in terms of technical quality, meeting contract objectives and value for money;
- to assess whether the content and objectives of the research programme were appropriate, taking into account responsibilities of other organisations with interests in drinking water research;
- to assess whether the outputs from research contracts were disseminated effectively to policy customers and for the scientific community;
- to assess the impact of the research on departmental policy;
- to establish whether value for money has been achieved, including consideration of whether the Department has taken advantage of opportunities for collaborative or consortium funding;
- to identify any wider technical or policy implications that warrant consideration in future research programmes;
- to make recommendations on the future scale and development of the programme; and
- to draft a ROAME statement for this research programme.

1.1.4 88 projects were identified for consideration in the evaluation from a complete list of all projects undertaken during the period to be covered in the Review. A list of these projects is provided in Appendix 2.

1.1.5 External assessment of research programmes is seen as a means of establishing whether research funding has been directed effectively towards supporting the achievements of the Department's policy objectives. The essential output from research assessment is

guidance on improving future programmes and appraisal of whether research has been well managed and useful to the Department.

1.1.6 DOE is committed to a programme of research assessment based on the ROAME statements (see 1.2). This review was intended as an **evaluation** - normally the final stage of the ROAME process. It had to provide evidence on the impact and value for money of the work completed and make recommendations including a ROAME statement for the next phase.

1.2 Research Evaluation in DOE

1.2.1 The evaluation needed to take account of the approach outlined in the DOE draft document "Guidance on Research Assessment and the DOE Forward Look" (March 1994).

1.2.2 This guidance document makes clear that programme evaluation completes the cycle of research assessment. It aims to provide evidence on the impacts and value for money of the research programme and make recommendations on the coming period as an input to its appraisal. The benefits of evaluation are:

- lessons can be learnt to improve future research programmes;
- evidence is provided that research has been well managed and is useful to the Department.

1.2.3 Two parameters are normally defined at the outset of an evaluation:

- the **scope** of the evaluation in terms of the programme to be covered and the time period and whether activities of other funding bodies are to be included;
- the **purpose** of the evaluation which may be for the usual reasons of scrutiny to improve the next appraisal round or in response to specific concerns such as whether a type of funding is effective or particular impacts are being realised.

1.2.4 Criteria for the evaluation are derived in part from the aims and objectives of the Programme and from the purpose of the evaluation itself. Generic criteria which should be covered in an evaluation study are:

- **efficiency**: progress made towards meeting the objectives efficiently in terms of time, cost, planned outputs, gaps and overlaps of research coverage, and identification of constraints;
- **outcomes and effectiveness**: achievement of planned objectives, impact of research on policy functions, quality of research in relation to its purpose;
- **appropriateness and alternatives**: suitability of the programme for achieving its goals (validity of the rationale), relevance of the programme to current policy needs and future policy concerns.

1.2.5 If, as in this case, an appraisal document is lacking, the specification of the evaluation is not as easy and a reconstruction of the past has to be attempted.

2. THE CONTEXT

2.1 The Drinking Water Inspectorate

A) The Legal Framework

2.1.1 For England and Wales, the most important piece of legislation of recent years in the water industry was The Water Act 1989. This re-enacted legislation that previously applied to regional water authorities and enabled the privatisation of the water industry, but at the same time it redefined, extended, and made more stringent regulatory arrangements which had been in force prior to 1989. The Act places a duty on water companies to provide water which is wholesome, the definition of which is laid down in Regulation 3 of the Water Supply (Water Quality) Regulations 1989. These incorporate the relevant requirements of the EC Drinking Water Directive (80/778/EEC).

2.1.2 Within this legal framework the Secretary of State for the Environment and the Secretary of State for Wales have to be satisfied that water companies in England and Wales are supplying wholesome water and are monitoring, recording, and reporting on the quality of drinking water as is legally required. Under Section 60 of the Water Act 1989, the Secretaries of State are empowered to appoint technical assessors to check that the various water undertakers are conforming to their legal obligations. The Drinking Water Inspectorate (DWI) was therefore established in January 1990 to fulfil this role. The main tasks of the Inspectorate are to:

- carry out the technical audit of water companies;
- initiate action as necessary to secure or facilitate compliance with legal requirements;
- investigate incidents which affect drinking water quality adversely;
- advise the Secretary of State on the prosecution of water companies if water has been supplied which is unfit for human consumption;

- provide technical and scientific advice to Ministers and officials of the Department of the Environment and Welsh Office on drinking water policy issues;
- assess and respond to consumer complaints when local procedures have been exhausted;
- identify and assess new issues or hazards relating to drinking water quality and initiate research as required;
- assess chemicals and materials used in connection with water supplies; and
- provide authoritative guidance on analytical methods used in the monitoring of drinking water.

2.1.3 The Water Act 1989 was almost entirely replaced by a number of Consolidation Acts which came into force on 1 December 1991. These include The Water Industry Act 1991, The Water Resources Act 1991, The Statutory Water Companies Act 1991, The Land Drainage Act 1991, and The Water Consolidation (Consequential Provisions) Act 1991. The major provisions relating to drinking water quality are contained within The Water Industry Act 1991 and the provisions of earlier acts especially The Water Act 1989 are now covered in this new Act. Under Section 18 of the new Act, the Secretary of State is required to take enforcement action to secure compliance by companies. This will include contraventions of the wholesomeness, monitoring, or treatment requirements of the regulations. Also included are contraventions in respect of records and the provision of information. Water supplied for the domestic purposes of drinking, washing and cooking, or for the purpose of food production will be regarded as wholesome provided:

- it meets the standards prescribed in the regulations for the particular properties, elements, organisms, or substances;
- the hardness or alkalinity of water which has been softened or desalinated is not below the prescribed standards; and
- it does not contain any element, organism or substance - whether alone or in combination - at a concentration or value which would be detrimental to public health.

B) Functioning

2.1.4 In its first year of operation, the DWI developed a process of technical audit. Its purpose was to determine whether water companies were complying with regulatory requirements, were on schedule with their improvement programmes, and were following good operational practice. The technical audit consists of periodical assessment of compliance based on information provided by water companies together with the inspection of individual companies to check the quality of the information collected and recorded. The regulatory system, therefore, encourages consultation and the emphasis is on water companies offering solutions rather than them having remedies imposed on them. It demands that the companies take responsibility through offering legally binding undertakings for getting things right.

2.1.5 Companies delineate water supply zones and these are monitored against defined parameters for compliance with standards. Parameters used in 1994 include:

- coliforms
- faecal coliforms
- colour
- turbidity
- odour
- taste
- hydrogen ion
- nitrate
- nitrite
- aluminium
- iron
- manganese
- lead
- polycyclic aromatic hydrocarbons (PAH)
- trihalomethanes
- total pesticides
- individual pesticides
- other parameters

2.1.6 The DWI, located in the Department of the Environment, has many government interfaces. It is, for example, in almost daily contact with the Water Services Division of DOE, and the Environment Division of the Welsh Office. It has to liaise with the Department of Health (DoH), the Ministry of Agriculture, Fisheries and Food (MAFF), the Scottish Office Agriculture, Environment and Fisheries Department (SOAEFD), the Department of the Environment for Northern Ireland (DENI), and the Office of Water Services (OFWAT). Meetings are held with the National Rivers Authority (NRA) (now the Environment Agency) (ENVAG) at both national and regional levels. Medical advice is obtained from the Government's Chief Medical Officer and the Chief Medical Officer at the Welsh Office. Their medical staff draw upon expertise from a variety of agencies including the Public Health Laboratory Service (PHLS). There are frequent contacts with environmental health officers and a range of professional bodies. There is also frequent contact with the water industry both with individual water companies and through their representational organisations, the Water Services Association (WSA) (including its contract operational company UKWIR Ltd) and the Water Companies Association.

2.1.7 The DWI has contacts with the European Commission, member states of the European Union and other organisations such as the American Water Works Association (AWWA). Inspectorate staff have also participated in the revision of World Health Organisation (WHO) guidelines for drinking water quality and have had a significant role in advising government on the scientific and technical aspects of the proposals published for a revised EC Drinking Water Directive. It expects increasing exchanges with experts in other member EC states in coming years. As an example, there have already been exchanges and visits of inspection teams with The Netherlands relating to the way in which inspection work is undertaken.

2.1.8 The DWI produces a substantial Annual Report on its activities and findings which incorporates information on the Water Quality and Health Research Programme. Since 1993, it has also produced a companion leaflet to the report written for a wider audience "How Good Is Our Drinking Water", which is available free of charge and has been distributed to over 55,000 individuals/organisations.

2.2 The DOE Water Quality and Health Research Programme (Area E)

2.2.1 This research programme can be considered to be a sub-programme (Area E) of the DOE Water Directorate's Research Programme. This is itself a component of the Environment Protection Group research programme. Much of the content of the Area E programme clearly relates to drinking water issues and when the DWI was established in 1990 the practice was initiated of reporting on the research programme in Chapter 8 of the Inspectorate's Annual Report where, until 1992, the programme was described as being "steered" by the Inspectorate. From 1993 onwards the research programme is said to be "managed" by the Inspectorate. As already indicated (see Section 1.1.2) the detailed objectives of the research programme were modified in 1993 and groundwater research had already been transferred to the National Rivers Authority (now the Environment Agency). The Standing Committee of Analysts (SCA) and related analytical research responsibilities were transferred to the Environment Agency in April 1996.

2.2.2 The publicly stated objectives of the programme (as recorded in the 1994 report of the Drinking Water Inspectorate) are:

- investigation of issues which relate to drinking water quality and health;
- development of new or improved analytical techniques; and
- investigation of changes in quality brought about by the treatment, distribution, and storage of water.

The research helps the DOE and the Welsh Office to formulate policy relating to the quality of public and private water supplies and enables the Inspectorate to make scientific input to European and international debate on drinking water issues. This public position, therefore, appears to indicate a duality in the role of the research programme with relevance to both Departmental policy formulation and Inspectorate scientific and technical underpinning.

2.2.3 The detailed objectives of the Research Programme (Appendix 1) clearly demonstrate a shift in emphasis to policy concerns post-1993. This also coincided with a stronger customer orientation in the formulation of the research programme where Departmental policy needs are seen as a key determinant. Prior to 1993, in common with many government research programmes, research requirements were research supplier-led through the provision of programme item forms (PIFs) from research contractors to government as candidate areas for research funding in the coming year.

2.2.4 The content of the research programme is now determined at an annual meeting of the Research Programme Committee chaired by the Inspectorate. Proposals assigned as having high priority are developed into detailed specifications by the Inspectorate and, subject to financial approval, research contracts are awarded usually by competitive tender.

2.2.5 Over several years, key research topic areas have included:

- lead
- pesticides
- nitrate
- *Cryptosporidium*
- blue green algae
- disinfection by-products
- microbiological quality
- polycyclic aromatic hydrocarbons (PAH)
- distribution systems
- backflow prevention devices
- European standardisation
- effectiveness of filtration
- materials testing

Contracts in such areas are now awarded across a range of commercial and academic research suppliers. In earlier years, the Water Research Centre (WRc) was a predominant contractor, but in recent years, although still a significant participant, it is

but one of a range of research suppliers used by DWI in the management of the DOE research programme as a result of competitive tendering.

2.2.6 As already stated, the research programme is reported on annually in the DWI Report on Drinking Water - a report to the Secretaries of State by the Chief Inspector of the Drinking Water Inspectorate. Research completed during the year is briefly described as is current activity and new contracts let during the year. In addition, copies of all research reports are reported to be placed in the DOE library and summaries circulated through the Foundation for Water Research (FWR). A publication would only be forthcoming if anticipated sales were expected to cover the cost. Failing such publication, it would usually be possible to obtain a copy of a report on loan by approaching the nominated officer identified in the annual DWI report.

2.2.7 In 1994, a total of approximately £900,000 was allocated to drinking water research though the spend has been somewhat less than this in subsequent years. By contrast, the funding of the Programme reported in 1990 was £1.25 million per annum. This decline is in contrast to increasing and substantial R&D spends by some of the larger privatised companies in the water industry.

3. WORKING APPROACH

3.1 Staff Resources and Responsibilities

3.1.1 Four staff were actively involved in work on the evaluation. Dr Keith A Harrap (KAH), Managing Director, Science Connections Limited, undertook many aspects of the work including examination and analysis of documentation, interviewing of officials, contractors, and designated consultees, and preparation of the report. Dr Harrap managed the project and was in sole charge of it.

Dr John Montague (JM), formerly of Harwell Laboratory, assisted with analysis of project files and report content relating to physical sciences.

Dr Iain Boulton (IB), School of Environmental Sciences, University of Greenwich, evaluated projects with biological characteristics particularly in the fields of toxicology and microbiology.

Sir Hugh Fish (HF) provided strategic advice and input on several aspects of the evaluation with particular emphasis on the appropriateness of the science. He also evaluated files and reports relating to several substantial projects.

3.1.2 The work plan and resourcing by the staff involved is shown in Appendix 3.

3.2 Desk Studies

3.2.1 A considerable amount of programme documentation was examined and key issues and points of information identified. This documentation included:

- policy files
- project files
- a report database list
- numerous interim and final reports of scientific work
- background information on organisations and their responsibilities

- review documents
- annual reports and other dissemination literature
- scientific support information from various sources

This information and extracts from it were coded and classified in various ways for the purpose of the evaluation work. Particular effort was made to improve the correlation of contract/project files and reports and the databasing of project information so that it could be categorised by contractor, financial size, and broad subject area.

3.3 Interviews

3.3.1 Interviews were held with:

- programme officers
- relevant department officials both in DOE and other government departments/agencies
- certain contractors
- water industry staff
- other relevant scientific professionals

Persons interviewed were identified by the DWI initially on the basis of satisfying a specified requirement to consult five experts ("consultees"). In practice, the number of persons with whom discussions were held in this category was eighteen.

3.3.2 Many interviews were conducted face-to-face, but in the interests of time a small number were done by pre-arranged telephone call.

3.3.3 Interviews were conducted in a structured and systematic way using a range of items for discussion in broad categories. These were:

- policy-related issues
- scientific aspects
- needs-related aspects

A list of those interviewed is provided in Appendix 4 and a proforma of the interview structure in Appendix 5.

3.3.4 Regular meetings were held with the nominated officer for the evaluation to discuss emerging issues and provide a progress report. Written synopses of progress were provided on occasion.

3.4 Evaluation Methodology

3.4.1 The evaluation work made use of generic criteria such as:

- efficiency
- outcomes and effectiveness
- appropriateness and alternatives

bearing in mind that the purpose of the evaluation was to focus on:

- comparing research subjects with policy objectives and questions
- examining the technical quality of research work and the extent to which objectives were met
- establishing whether value for money had been achieved.

3.4.2 In considering **efficiency**, management issues were a key concern together with the planning of, and constraints to, research activity. Considering **outcomes and effectiveness**, the achievement of objectives, the quality of research, the impact of research (for example on policy), its usefulness, the way in which information was disseminated, and value for money were taken as key criteria for analysis. In considering **appropriateness and alternatives**, the overall suitability of the programme for achieving its goals and its relevance to policy needs and future concerns was assessed, in particular in relation to rationale and original objectives in the absence of any specific ROAME statement for the programme at the outset. Attention was paid as to whether alternative approaches to dealing with the issues and

concerns under investigation were possible. To underpin this approach, answers were sought and, where appropriate, a score awarded in three areas:

- quality of research
- usefulness
- value for money

Within each of these areas, specific features were analysed and, where appropriate, scored for each project considered. Comments were made or notes provided in each area when pertinent. A proforma for this systematic project evaluation is provided in Appendix 6.

3.4.3 It is recognised that such systematic scoring is somewhat blunt and cannot compare with the more sensitive assessments that are the norm of peer reviewing. Peer review is, however, very subjective and largely concerns scientific quality. The purpose of a structured approach is to minimise that subjectivity whilst taking into account various other factors of interest and concern to the customer or funder of the research whose performance needs to be addressed. In practice, detailed discussions of the scoring of individual criteria for a particular project are not beneficial and generally do not greatly influence the overview of a programme as a whole. Such an overview usually provides a fair reflection of performance.

4. INFORMATION RETRIEVED

□ *This Section of the report sets out factual information obtained from desk studies and discussions with others. It might, therefore, reflect the opinions of the people interviewed or recorded on file, but it does not necessarily embody the views or interpretations of the evaluation team. These are developed in Section 5.*

4.1 Policy and Strategic Aims

4.1.1 The purpose of R&D programmes in DOE is to satisfy policy needs essentially relating to information ministers require when formulating policy. For the Water Quality and Health Research Programme, this "informing policy" role is driven by a number of factors. Prior to 1993 the Area E sub-programme was designed to identify and assess health risks of organic and inorganic compounds in drinking water, the means of assessing chemical and microbiological quality and related treatment processes including requirements of the EC Drinking Water Directive, and the assessment of risks to quality of groundwater resources.

4.1.2 Since 1993 the Programme's objectives are stated in the context of four subject headings more closely reflecting current policy concerns. These involve European regulatory obligations where the research need is to support UK input to the review of the EC Drinking Water Directive and assess the significance of revised WHO guideline values for drinking water. The policy position here is that any review of standards should be based on sound science. Failure to generate sound science leads to uncontested adoption of the precautionary principle with its implications for increased costs of regulation and treatment. Secondly, in a national context, research is needed to inform the Secretary of State whether water companies are meeting regulatory requirements and to do this there is a need to periodically review these requirements to assess whether they strike the correct balance between the need to protect the consumer and the costs that must be paid for that protection. Simultaneously, DWI must itself keep abreast of water quality and health issues to underpin its advice to water companies as to whether their investment proposals reflect a balanced view of risks and obligations. Additionally, there is a need to ensure underpinning information

relating to the approval of the use of substances and products in contact with water supplies. Thirdly, the Inspectorate has a role in providing scientific and technical input to the DOE programme supporting work in the Comite European de Normalisation (CEN) and the International Standards Organisation (ISO). If such standards were not supported effectively by underpinning scientific and technical knowledge, export potential for the UK could be lost and/or unnecessary regulations and restrictions placed on industry. Finally, the Programme has the facility to commission a modest amount of basic research taking a view either of more distant problems or filling gaps in current knowledge.

4.1.3 The newly formulated objectives are recognised to have improved thinking. But beneath the overarching aim of providing safe water to consumers, and therefore a requirement for a regulator to ensure fulfilment of that aim, there remains a number of convoluted policy objectives and interfaces with other organisations - both within and outside government. Some would see one aspect of this as the positioning of the Area E sub-programme within the Water Directorate as a component of that Directorate's research programme. DWI is seen here as undertaking an executive role in relation to the formulation and delivery of the research programme with its raison d'etre lying firmly within the policy divisions of the Directorate. In this scenario, they would view the role of DWI as one akin to technical adviser so that the research programme properly meets the needs of policy officials.

4.1.4 On the other hand there are those, more particularly outside government, who see the research programme as a child of DWI whose role is to underpin DWI regulatory functions. These, it is assumed, must not only have an appropriateness for the DOE but recognise the involvement and interest of others in the field of safe provision of drinking water. The interface, therefore, between the Inspectorate and the Department in which it sits lacks clarity as far as the rationale of the sub-programme is concerned. Some feel that this lack of clarity has had a tangible effect in that funding for the Programme has shown a consistent decline since the Inspectorate was established as a result of pressures on DOE R&D spend as a whole. If the thrust of the programme is to be interpreted as underpinning the functions of the Inspectorate, such reducing spend on regulation of a now substantial privatised industry is puzzling - particularly

when set against the increasing research spend (and therefore potential for setting the agenda) of the industry itself. If, on the other hand, as appears to be strictly the case, DWI simply acts within the Water Directorate as executor of one of its sub-programmes, the context of reducing research funding is more diffuse.

4.1.5 In using public funds, therefore, the appropriateness of the research whether as a sub-programme for DOE or attracting the interest of others in a sector that supplies a vital life sustaining product to the entire population is confused by the absence of a clear rationale and locus. If government doesn't articulate its own thinking here it will ultimately be driven by the thinking of others - as several stakeholders made clear.

4.1.6 The culture and characteristics of the research programme from a policy standpoint are also seen in very different ways. Policy aims are now felt to be better aligned with industry's concerns. Defence of the UK position in EC circles as regards requirements for meeting standards (often through increasingly sophisticated technology but possibly entailing excessive cost) and the need for sound scientific evidence to support such moves are certainly appreciated by operators.

4.1.7 In the main, this has resulted in a willingness to achieve better collaborative research as the "need to know" basis of policy aims finds a breadth of support. However, there are some bodies in the water sector who still prefer to be distanced from the aims of government policy.

4.1.8 Prior to 1993 scientific contractors - the research suppliers - often set the agenda of the research sub-programme by using Programme Item Forms (PIFs) submitted as proposals for what scientists felt were the needs of the sub-programme in the coming year(s). This is now replaced by a stronger needs-related agenda for the programme with its roots in the policy needs explained above.

4.1.9 This shift of emphasis from supplier to customer in determining the agenda of the research programme does, however, cause difficulties in formulating ideas and establishing priorities, particularly in periods of ever declining funding. There are those who feel that without a clear research strategy this is almost an impossible task if

it is to be effective. Others saw the absence of a clear research strategy for this government programme as only reflecting the absence of a UK strategy for drinking water overall.

4.1.10 On policy issues relevant to health, Department of Health channels are used for communication on the content of this research sub-programme. Despite this support, however, the Department of Health is not a contributor to funding of the programme. The view has been advanced that water is not a major health hazard in the UK. When problems arise they are detected quickly, either as a result of underlying medical care in the community and validation of outbreaks or contaminations, for example, in public health laboratories, or the actions of other regulatory agencies (such as the Environment Agency).

4.1.11 Similarly, agricultural activities have an impact particularly in relation to either microbiological or chemical contamination of source water, but committee representation in relation to formulation of policy objectives is again not translated into programme funding. A better specified research strategy for the Programme based on known policy needs might attract more tangible input than simple committee participation, particularly in fulfilling the strategic goals related to risk assessment or issues management - areas in which those offering advice could become active stakeholders. In the absence of such a coherent strategy the aims of the Programme, though supported, are not attracting other government stakeholders in any meaningful way.

4.2 Interfaces

4.2.1 As alluded to above, the interfaces of the Area E research sub-programme are complicated. There are interests in central government in the Department of Health, and the Ministry of Agriculture, Fisheries and Food. There are interests in the Scottish Office and the Department of Environment for Northern Ireland. There are interests in agencies with regulatory responsibilities such as the Environment Agency (formerly the National Rivers Authority and HMIP). There is involvement with both private sector and public sector suppliers of drinking water to the public - whether from large utilities

companies or small water companies. There is contact with representative bodies of the water industry such as the Water Services Association (WSA), UK Water Industry Research (UKWIR) Ltd, and the Foundation for Water Research (FWR). There is contact with the Office of Water Services (OFWAT), tasked with defending costs to the consumer in a market where true competition is virtually impossible to achieve. There is involvement with academic institutions both as research contractors and in other ways, with Research Councils who fund their work, and with research institutes that pursue both commercial contracts and academic research grants as a means of funding their activities. There is involvement with the PHLS both in its own advisory capacity where it underpins epidemiological assessment of public health and as a commercial contractor bidding for DWI research contracts. There is involvement with European initiatives in research in both public and private sectors and in legislation and definition of standards in evolving Directives. There is further international involvement, not only in research fields for example with workers in North America, but with UK industrial and trading interests in an evolving export market for technological products and services.

4.2.2 With such a complexity of contacts with interests in the research programme it is not surprising that, in spite of increasing dialogue, individual discussions clearly revealed individual agendas for the different organisations or groups of organisations concerned. Despite commonality of interests, long term intention is sometimes not clear; opportunities for omissions or duplication of research activity are obvious; and the need for collaboration - though widely subscribed to - can be difficult to bring about. There is also considerable disparity in spending on research between, for example, the DOE Area E sub-programme and the major private sector utilities such as Thames Water or Severn Trent.

4.2.3 It seems clear that there is now a willingness in the privatised water industry to work with a regulator such as DWI. For the industry, such involvements can bring credibility to research findings that might otherwise be deemed to be suspect. For a regulator struggling with decreasing R&D funding it is a way of achieving added value. There are difficulties however. As explained, DWI is not entirely in control of research funds for the programme which it manages, or in early years, steered. Declining

funding might be viewed in the world outside as lack of commitment. Also, the ultimate aims of the regulator and the supplier may be different. The collaborators therefore need to specify quite clearly what the aim of the collaborative programme is, even though its findings may ultimately be subjected to different interpretations.

4.2.4 Economic issues should be prominent in the formulation of research objectives, not least so that new technology and the application of ever more stringent standards does not automatically lead to increased costs for the consumer, but might in contrast produce operational procedures or types of technology that reduce such costs.

4.2.5 The real interface for collaboration in research for DWI is with the industry, in particular the privatised industry in England and Wales. This may not, however, be the appropriate interface for DOE and so underlines the dilemma pointed up in 4.1.4 as to whose research programme is it anyway. Many issues of concern to the regulator are also of concern to the supplier, particularly in terms of microbiological and chemical contamination, performance of treatment works, contaminations within the distribution system and so forth. It ought to be possible to demarcate key areas of interest between the regulator and supplier so that, for example, the regulator is more concerned with policy and standards issues in terms of better analysis and recording; whereas industry would be concerned with operational issues. Some boundaries might be less clear, but if these are recognised projects can be specified accordingly.

4.2.6 Such collaborative work with the industry would normally be formulated in negotiation between UKWIR Ltd, and DWI where UKWIR is acting on behalf of a number of private water companies on a "single voice issue" of interest widely within the membership. One problem that is clearly seen already is the speed of decision making. Companies claim that they tend to move quickly using project management available to the subscribing companies of UKWIR whereas government bodies are much slower and are also constrained by funding difficulties. Government bodies do not necessarily agree. The way in which *Cryptosporidium* has been tackled on a collaborative basis is recognised as a good example as are initiatives such as the Groundwater Forum for identifying issues of concern as an agenda for research. Industry did express the view, however, that it would like to see a bigger DWI programme not only in order to

produce more robust collaborative research, but because there is an industrial belief that a strong regulator is good for the industry.

4.2.7 The way in which collaborative programmes are executed again needs to be tightly specified. A strong private contractor could no doubt always manage collaborative effort and certainly the regulatory body, DWI, should not assume that it should always lead in such collaborative work. Conversely, neither should it be seen simply as technical advisers as some in government have argued.

4.2.8 Whatever the complexity of the interfaces relating to the Water Quality and Health Research sub-programme, the overwhelming impression was that professional contact between those involved with the science, technology, and engineering was very good and one of mutual respect. Subject to sensible definition of aims and objectives, it ought therefore to be possible to evolve exciting, relevant, and meaningful collaborative programmes as a result of direct professional contact between those who will be involved.

4.3 The European and Other Overseas Dimensions

4.3.1 Despite the fact that the policy needs driving the sub-programme in DOE have a strong EC axis, meeting these needs through collaboration with European research organisations is scant. This is in contrast to other areas of environmental science where substantial programmes have been generated in which significant added value has been achieved as a result of collaboration with laboratories in EU countries.

4.3.2 The undoubted difficulties and long timescales that are the norm in putting together research programmes with European partners are well recognised by many involved with drinking water research. Nevertheless, many who have travelled this road in other scientific areas have usually felt it to be worthwhile. The problem in drinking water research appears to be at a policy level, resulting in different treatment procedures, different prioritisation of issues such as *Cryptosporidium*, completely different approaches to the organisation of drinking water supply in different governments, a different culture to European research programmes in this area in that

they are less needs-led and more academically inspired, and considerable differences to sourcing of water for drinking water supplies in different European countries. This means, for example, that an attempt to produce a consolidated report by the EC is still awaited with interest by those in the drinking water sector in the UK.

4.3.3 Nevertheless, there have been initiatives such as EUREAU taken by drinking water suppliers forming a grouping to identify common interests and causes of concern. Some UK personnel have played leading roles here through chairmanship of committees and similar positions in an evolving organisational grouping. Certainly there are those who feel that such a group may bring better cost pragmatism to thinking in the EC with beneficial impacts, from their standpoint, on the requirements of European Directives.

4.3.4 Because EUREAU is a strengthening organisation in Europe, there are those calling for better communication between EU countries' regulatory bodies on some Europe-wide basis. A way must be found of achieving this that avoids wrangling between member states endeavouring to achieve European dominance of their own regulatory procedures and standards. One recent initiative here is the Taskforce Environment, Water, in which DWI officials have been taking a catalytic role.

4.3.5 A further problem in Europe is that drinking water research responsibilities tend to fall, as they do with other environmental issues, between DGXI and DGXII and effective lobbying will be needed to access R&D funding in DGXII relating to policy concerns in areas such as drinking water quality for which there is responsibility in DGXI.

4.3.6 It is interesting to note that in areas of Inspectorate activity other than research increasing contact is occurring between the UK and member states such as The Netherlands relating to procedural and standards issues and their enforcement. There is also input through DWI and PHLS to CEN and ISO committees. In contrast there is only halting progress in research collaboration with member states in Europe.

4.3.7 Collaborative effort with North America through the aegis of the American Water Works Association Research Foundation (AWWARF) is an emerging success and worthwhile activities have involved both the water industry in the UK and DWI.

4.4 The Science and Its Contractors

4.4.1 61 projects were reviewed overall by members of the Review Team, though for 18 of these only the report was available for assessment purposes and no filed information could be retrieved. The predominant contractor was the Water Research Centre (WRc), particularly in the earlier period under review. Indeed, 33 of the 61 contracts reviewed were undertaken by this organisation. Other contractors included private sector contract research organisations, university departments, public health laboratories, water company research and analytical laboratories amongst others.

4.4.2 Scored values assigned to projects against the range of pre-identified criteria selected for the evaluation are tabulated in Appendix 7. Whilst not being always innovative or seminal research, the bulk of the projects represented sound and solid scientific achievement generally scoring well. A few projects scored poorly in terms of scientific quality, but this is not unexpected in R&D programmes of this type. Individual scoring of projects should not be assigned undue significance because of the subjective nature of individual assessments from the variability of filed information. This is particularly so where documented information was lacking. However, across the Programme as a whole, the pattern of scoring is a reasonable indicator of performance.

4.4.3 A particular strength of the programme is in its **scientific quality**. The policy link or statutory requirement to be addressed by the research project usually scored highly. Similarly, good scores were generally achieved for the statement of objectives and their realisation. Overall, the execution of projects was usually done satisfactorily but there was some variability in the quality of the reports. Whilst some of these were well thought out and written clearly others were below standard, and sometimes still so after considerable efforts by programme officers to achieve improvement.

4.4.4 In general, **usefulness** of the research scored well. However, it was not always possible to assess this characteristic when the relevant files could not be obtained. Sometimes the use of the results was obvious or stated; in other instances the take-up route for the findings was not so apparent. Aims were generally achieved but the innovative nature of the work was rather more variable even though this aspect was perhaps scored generously to give credit to technical, in contrast to scientific, novelty.

4.4.5 Relevance generally scored well but user orientation of the findings and effectiveness of technology transfer were sometimes difficult to establish and showed some variability. Dissemination overall attracted more negative scores than other parameters in the "usefulness" characteristic and the impression that it was patchy was supported in discussions with various parties.

4.4.6 **Value for money** is notoriously difficult to assess for research projects as it often depends on the impact of results over time. Inevitably there is a degree of subjectivity here in the absence of detailed impact studies. Again it was not always possible to assess this characteristic when the relevant files were not available The characteristic generally scored well, however, despite the substantial financial size of some of the earlier contracts placed, in particular, with WRc. One is left with the impression that better value for money would be achievable now than was the case in the mid-1980s but the scoring reflects a view of what was possible at the time.

4.4.7 Achieving added value was not a significant feature of the projects. Their technically focused nature might limit potential here. Similarly, recent tightening of projects specification and competitive tendering tend to reduce added value potential. Collaborative work can often achieve added value by its very characteristic of bringing different professional scientists together but collaboration was not a strong feature of the projects reviewed.

4.4.8 There is certainly a view that historically the relationship of the privatised companies with the Water Research Centre (WRc) articulated through the then role of the Foundation for Water Research was far too cosy. This led to the formation of UKWIR Ltd in the Water Services Association (WSA), which represents the privatised

industry, in order to sharpen and deliver contract research management on "one voice issues" for the privatised industry as a whole. Simultaneously , DWI itself moved away from the PIF mode of research commissioning, often based on single tender action, to competitive tendering for projects specified on a needs-basis within the Department.

4.4.9 One outcome of such a change of policy can be the loss of centres of excellence in scientific areas nationally. There is much debate as to whether research funders, such as DWI, other government agencies, and the privatised industry, should see advantage in maintaining the capability of such centres of excellence through repeat funding or whether such reputation should properly be founded on success with a number of research funders. By and large, the latter view has prevailed. However, the National Centre for Toxicology based in WRc has been established as a centre of capability by agreement with a number of funding bodies such as the Environment Agency, HMIP, DOE, UKWIR Ltd and others through which single tender action is able to be justified on a case by case basis.

4.4.10 There are certainly some in government who feel that this was a retrograde step and represents yet again a basis upon which research contractors can specify government research agendas. Conversely, such well favoured contractors undoubtedly feel that they can bring added value and catalyse collaborative arrangements because of their role as a centre of excellence servicing the needs of a number of customers. Certainly it is argued that such established centres of excellence will be listened to by government which itself is of value. The majority view, however, would be that contractors have an input to what research can do, but should not set its agenda on behalf of the customer. If they do, and there is evidence of this, they are able to double sell their capabilities fostering duplication and detracting from value for money. It is quite possible to establish, as has been indicated above, collaborative research on a "need to know basis" that is of good quality and can flourish without facilitation through centres of excellence. Rather it is for those with the need for the research to establish the modes in which they will collaborate rather than leave it to those organisations which will supply their requirements.

4.4.11 In a collaborative arrangement, industrial needs might be perceived as initially revolving around processes at treatment works, and more latterly in distribution. Longer term research on removal of substances of health concern might be a responsibility of the DOE Area E programme managed by DWI. However, there is perhaps a wider collaborative agenda for work with UKWIR Ltd, currently with a £2.6 million annual research budget, relating to water quality in the distribution system, certain aspects of toxicology and biological threats.

4.4.12 One dilemma is the extent to which the Water Quality and Health Research Sub-Programme should consider water quality from an aesthetic standpoint. More fundamental, however, is the extent to which it should move towards longer term strategic research in contrast to the short term, essentially tactical responsive projects that are funded at present.

4.4.13 Some feel that only NERC is undertaking such strategic work at the moment, but the dangers here are that the planning of such work is oversensitive to the concerns of academia and although fundamental research should perhaps be undertaken in the academic environment of universities, it needs to be well specified otherwise potential contractors could be too influential in respect of its long term objectives.

4.4.14 There is support in the privatised industry for publicly funded longer term research as it is seen as a general endorsement of the research undertaken in the water sector. Industry itself, however, prefers to stick to nearer market issues. Many feel there is a need to solve problems not find them - which is a danger in unplanned strategic research activity. It would be important therefore for technically conversant policy officials to have an input into the terms of reference of such longer term projects so that projects are not simply science-driven. The influence of contractors or potential contractors is likely to be only in relation to their own scientific areas of interest.

4.4.15 What is really required for strategic research on drinking water is a definition of need in the form of **theme areas** with a number of stakeholders agreeing what the long term objectives should be. Such theme areas could take account of socio-economic inputs

and other inputs which are lacking in the research programme at present. The research must be focussed and well delineated so that its long term rationale is justifiable.

4.4.16 In contrast to this approach, there is a strong alternative view that strategic research for its own sake cannot be justified. Strategic positioning can be adequately brought about as a result of the build up of tactical research projects overtly addressing needs and well targetted on a problem. Those with this view tend to feel that there is a danger that opening the door to strategic research, perhaps through some framework contract with an academic institution financing post-graduate work or via a management contract with some external organisation, will again lead to research contractors setting an agenda for drinking water research in the future that is out of line with, and of limited value to, the policy needs of government.

4.4.17 The dominant view, however, was one of unease that current and reducing research funding in the sub-programme was too responsive to immediate concerns and therefore of too tactical a nature to provide an underpinning strategic direction for drinking water research beyond the year 2000. Some felt that imaginative steps should be taken to correct this and that this action in itself would lead to improved thinking about a strategy for drinking water as a whole in the UK as distinct from simply establishing a long term research agenda.

4.4.18 Some felt a useful starting point would be to convene brainstorming research fora to develop strategic objectives based on need as had been done for groundwater research under the auspices of FWR and in other aspects of the *Cryptosporidium* work. Such thinking would establish the agenda for longer term research in a meaningful way which could be the starting point for planning how it was to be implemented and its collaborative basis.

4.5 Management Issues

4.5.1 The Area E sub-programme, Water Quality and Health Research, is one of five DOE research sub-programmes in the Water Directorate's Research Programme. Before the Drinking Water Inspectorate was established in 1990, the Drinking Water Division

"owned" the Area E sub-programme. Responsibility for the majority of the sub-programme was transferred to the Inspectorate in 1990 though groundwater and surface water research was transferred to the then National Rivers Authority. Since 1990, DWI has managed the Area E sub-programme as part of the technical support provided to Water Services Division of the Water Directorate in DOE. The inherited programme of research was largely consistent with DWI's own research objectives and where new and revised projects were sought the programme committee generally accommodated DWI requirements.

4.5.2 Until 1993 the Programme was developed at an annual meeting of the Programme Committee. The Committee comprised representation from relevant Divisions/Directorates of DOE (eg WS, WRM), representation from the Welsh Office and Scottish Office, the Department of Health, the National Rivers Authority (now the Environment Agency), the Office of Water Services (OFWAT), and major contractors such as WRc and PHLS. At such meetings, a number of proposals were submitted by contractors or Divisions of the Water Directorate as one page summary Programme Item Forms (PIFs) and priorities for the proposals were assigned. After funding for the Water Directorate component of the Environment Protection Research Programme was confirmed, a sift meeting was held to allocate funding between the different Directorate programme areas of which the Area E Sub-Programme was one. Research proposals within the agreed budget were then submitted to ministers for approval, usually around the end of the calendar year. Based on the PIFs, the majority of contracts were then placed by single tender action. Before 1991, research contracts were usually assigned by single tender action to a contractor demonstrating a record of achievement in the subject area of interest.

4.5.3 During 1992 several long running projects were completed releasing potential funding for new projects. There was a Departmental requirement for competitive tendering and as a consequence the PIF system was abandoned in 1993 to be replaced by internally developed proposals. In the new process, which appears to have undergone some evolution, a Research Ideas Meeting is held in June/July involving representation from DWI and Water Services Divisions of the Water Directorate, other relevant DOE Directorates, Department of Health, Welsh Office and Scottish Office. This is

followed by a Research Programme Planning Meeting (the former Research Programme Committee Meeting) in the Autumn (September to November) where in addition to internal representation of DWI, WS and WRM in DOE, DOH, Scottish Office, Welsh Office, and NRA, external organisations such as the Water Services Association, the Foundation for Water Research, OFWAT, UKWIR Ltd and NHS Estates were also present. The purpose of the meeting is for the Water Directorate to consult with representatives from other government departments, regulators and other organisations promoting research to:

- assess and prioritise new research proposals;
- avoid duplication with other research programmes; and
- consider possibilities for joint funding.

Subsequently, a sift meeting is held in November or December when the research funding allocation for the sub-programme has been decided, in order to prepare a costed submission of proposals to ministers.

4.5.4 Contracts are placed primarily by competitive tender, single tender action only being possible when unique or immediately prior research experience in the topic area is involved. Specifications for the projects are generally written by DWI, WS or DOH officials. A tender board considers proposals received. The board usually comprises two DWI officials plus one other, and the contract will be placed with the best experienced, professionally capable organisation offering the best value for money. Price is often the deciding factor.

4.5.5 The contract is monitored by a contract manager who, normally on a monthly basis, ascertains what should have been done, what has been done, and whether there are any problems - often on the basis of a telephone call. For larger projects, a steering group or committee may be involved and progress meetings may be held. If particular difficulties occur with projects the contract manager may intervene. Legal action is rarely used, but payment may be withheld. On completion, the draft final report is evaluated by those sitting on the original tender board and decisions are made as to where the reports should go or whether other forms of communication, such as the

holding of a seminar or production of a manual, should be instigated. In general, in any one financial year, there are around 65 active contracts.

4.5.6 The more open appraisal process for the Area E sub-programme is welcomed by outside organisations, though a number feel that they have only a distant influence and as they are uncertain as to the overall procedure leading to programme appraisal, there is a feeling that they may simply be "pawns in a game". This could be overcome by prior discussion to establish needs. It would also help to dilute the criticism that the timescale of decision-making is too slow in relation to that used in the private sector. Many outside bodies feel that the exchange of views with DWI is now much improved and better than in certain other areas of contact with government. The lack of influence on the appraisal process by contractors, including significant former contractors, is welcomed. Those closer internally to the appraisal process were generally satisfied that they were fully involved even though the comment was made that new ideas can sometimes be difficult to come up with particularly if underlying needs are not well specified. Some felt an external resource could be tasked with addressing this. Others felt that economic questions must figure more strongly in the frame so that candidate technology, possibly leading to new and more discriminating standards, should be of auditable quality.

4.6 Dissemination, Take-Up and Impact

4.6.1 The principal output from a project in the research sub-programme is a report. A considerable number of reports (usually multiple copies) are held in DWI offices in DOE, Romney House in Marsham Street. A rudimentary database of these reports has been produced giving details of title, contractor, date, key words and the number of copies held. The database, however, is not yet in a searchable format, though it represents a significant improvement on what was available previously in terms of listing of report outputs. Reports are sometimes published by HMSO, sometimes by the contractor (especially if it is a large one like WRc), sometimes by DWI or the DOE in its own right. In general, HMSO is less inclined to publish reports that are unlikely to have a sale of several hundred copies. Some reports are published by the FWR which, at one time anyway, handled dissemination of reports for which WRc had been

the contractor. Under a special membership arrangement for DOE (a contributor) FWR receives copies of the executive summaries of all research reports and undertakes certain aspects of dissemination. Reports are also distributed to known interested parties by the contract manager and/or the contractor, and elements of reports may appear in published refereed journals. Copies of the reports are held in the DOE library and the British Lending Library and are also available in the libraries of major contractors such as WRc.

4.6.2 In other instances, depending on project topicality, presentations may be made, workshops may be held, information letters may be sent to industry, and reports, report extracts or data may be sent to specialist committees such as the Committee on Chemicals and Materials of Construction for Use in Public Water Supply and Swimming Pools (CCM).

4.6.3 Take-up of reported information also occurs within the Inspectorate system in the form of guidance to inspectors undertaking regulatory work or by the contract manager acting as an information source or liaison point for the inspectors who may seek advice on particular issues or problem areas.

4.6.4 Similarly, research report output material has been used in the preparation of "blue book" publications of the Standing Committee of Analysts (SCA) relating to methods for the examination of waters and associated materials. The SCA was established in 1972 by the DOE and until recently was managed by the DWI. It has now been transferred to the Environment Agency. It has nine working groups each responsible for one section or aspect of water quality analysis. Methods described in "blue books" must be deemed capable of meeting specific performance criteria and it is this performance of the methodology that the research outputs often influence.

4.6.5 The major output from the DWI is the Annual Report by the Chief Inspector on Drinking Water to the Secretary of State for the Environment and the Secretary of State for Wales. Chapter Eight of this report deals with drinking water research and outlines research completed during the year, that which is still current, and the research contracts let during the year. It also details how further information can be obtained

on requirements for research in the future and on requesting loans of reports resulting from completed projects. It is the intention of the Inspectorate to make its research outputs available more widely through the Internet in the future.

4.6.6 In general, those within government that had involvement with project appraisal were satisfied with the dissemination of research outputs and the overall availability of information from the research sub-programme. Others, however, particularly from outside organisations or the private sector, felt that communication was only effective when you were close to events. Perceptions of the totality of the programme were poor and even some individuals who had had contact with it were extremely critical. For example, communication from the DWI about research activities was compared unfavourably with update publications from the AWWA Research Foundation ("Drinking Water Research"). In certain specific areas, however, notably *Cryptosporidium*, dissemination of findings was generally appreciated. This was perhaps because a number of meetings had been held and meetings or workshops were felt to be an effective communication channel. Some individuals felt that research output information ought to be available via the Internet. This would particularly help to overcome one criticism relating to dissemination of research outputs to professionals such as engineers. They would often have involvements in the drinking water area but could not easily access research information and were not well briefed on recent research findings.

4.6.7 As already discussed, take-up and impact of research findings has occurred via the SCA "blue book" publications and as a result of guidance provided for inspectors in DWI. The contract manager does attempt to monitor impact which can occur as a result of dissemination of information to water companies through bye-laws, by publication of a manual, through information provided on best practice, and in relation to EC Directives that have been modified as a result of research undertaken in this programme in the UK - lead was cited as an example. In the policy area, however, some felt that the major contribution of the research output so far in terms of impact had been to improve thinking rather than achieve changes in Directives or legislation.

5. ANALYSIS AND COMMENTARY

5.1 Policy

5.1.1 The sub-programme on Water Quality and Health would benefit from a research policy statement which clarifies its rationale. This is particularly so in view of the programme's evolution within the Water Directorate subsequent to the establishment of the DWI and as a result of new arrangements put in place since. Such a research policy statement might be easier to draft as a derivative of an overall policy statement for drinking water in England and Wales. But it would have to take into account a research dimension relating to drinking water for other parts of the UK, and within the EU and more widely, where organisational arrangements are different particularly in respect of a privatised sector. The purpose of the research sub-programme needs to be made clear and its objectives restated in a way that does not simply indicate areas of coverage as these do not in themselves represent objectives. If a policy position for the sub-programme can be set out in this way a research strategy can be developed based on a rationale that is meaningful to those both inside and outside government. Such a rationale might, for example, be based on risk assessment in relation to drinking water standards or issues management in relation to the supply of wholesome drinking water to the consumer. Certainly the complexity of water sector involvements makes the need to define the policy position of this research programme quite urgent.

5.1.2 The raison d'etre for the research programme within DOE itself also needs clarification. The question must be answered as to whether this sub-programme is simply a Water Directorate component research programme that is managed by DWI as a result of its technical advisory role in the Department. If that is so, its policy positioning and consequent research strategy will follow accordingly. Alternatively, the sub-programme may be considered to be the research programme of the DWI thereby taking account of the relationship of the Inspectorate's activities to the DOE and its policy development. Currently the research programme appears to be endeavouring to fulfil both roles. If it is to be the DWI Research Programme, which in many ways is how it operates now, a more meaningful case is possible for demarcating a research spend within an Inspectorate budget rather than a research spend from a

Water Directorate and ultimately Environment Protection Group research budget. This would simplify the ways in which, for example, collaborative research could be funded to deal with both short term and longer term needs in the drinking water sector. However, it is recognised that such a devolvement of responsibility for research spend runs counter to current practice for establishing research funding in DOE as a whole.

5.2 Interfaces

5.2.1 The interfaces between the DWI and others with an interest in, or impact on, its roles need to be delineated. It should then be easier to define the interfaces of the research programme once it is clear how it relates to the Inspectorate itself (see 5.1). For those other organisations with interests and responsibilities in drinking water research, much of this delineation emerges through serendipity rather than clearly understood rationales. Only in the case of the Environment Agency was a clear principle articulated that defined the responsibilities of respective research programmes. Though it may be tedious it should not be difficult to achieve similar demarcations that can be clearly stated in relation to other bodies involved in drinking water both in government and outside it. Time spent defining these interfaces will pay dividends in establishing collaborative research, in specifying that research, and in defining the roles of the partners involved. There should be no difficulty in establishing a "need to know" requirement. The problem will be how to implement the fulfilment of that requirement through the use of organisations with different, though at times closely related, responsibilities.

5.2.2 Another aspect of interface issues relates to the more pragmatic one of timing. Time constraints, which may also relate to budgets, can pose particular difficulties in collaborative work if the relationships between the partners are not clearly understood and defined. Problems of timing of delivery can threaten the whole collaborative exercise. If the interface is understood such decision making constraints can very often by accommodated within a project plan.

5.3 European and Overseas Aspects

5.3.1 Involvements with European and other overseas initiatives in relation to drinking water research are variable and this variability is compounded by the difficulties in properly defining the interfaces between UK organisations as outlined in Section 5.2. There is an urgent need for European government organisations to forge a working relationship that is meaningful in EU terms in order to maximise added value funding through the Framework Programme. This would also counter balance organisations of increasing influence such as EUREAU which will articulate views of suppliers at a Commission level possibly to the detriment of national regulators. DWI officials must work at this area particularly the new Mirror Taskforce Initiative which could represent an opportunity for achieving more funding for drinking water research to the benefit of the UK. The difficulty of attribution relating to UK government research funding is recognised but the added value achieved should still outweigh this drawback.

5.3.2 There is also a need to foster liaison between Directorate-Generals such as XI (Environment, Nuclear Safety and Civil Protection) and XII (Science, Research and Development) if research funding available in the Commission is to be taken advantage of in addressing drinking water research issues. Such a role may be difficult for government and it may be necessary to task an independent research foundation unfettered by national government identity to undertake it.

5.3.3 There is also work to be done in changing the character of European science so that it is more in line with the UK model now established for drinking water research whereby needs are better articulated and academic abilities are marshalled to fulfil those needs. As one discussant described this "the EU big bang academic approach" to drinking water issues, is not productive and it will be necessary for policy work to go hand in hand with scientific capability to establish a change of culture.

5.3.4 Research contact through the American Water Works Association Research Foundation is an exciting initiative that has broadened research activities in the field in an imaginative way. It also has the advantage that as it is an independent Foundation

various parties involved in UK drinking water research can participate. Possibly though, the national origins of this organisation mean that it can never achieve a pivotal role in relation to either UK or European drinking water research unless is became a more obviously international rather than US organisation.

5.3.5 Drinking water is an international business. Although this was mentioned only once or twice in discussion it is a dimension of the research investment that should not be forgotten. Opportunities for international trade of some substance exist and are being exploited by UK water companies. The research undertaken can bring added value to this effort on behalf of UK Limited and in this context intellectual properties can also be important. Where research activity is relevant to overseas issues and technical problems in the provision of safe drinking water, this should be recognised, publicised, and protected in a way that might enhance the ability of UK companies (or other organisations) to win overseas trade. One important form of such enhancement is recognition of research endeavour through involvement of government agencies such as DWI which undoubtedly provides a credibility value. This added credibility value should be a factor to be taken into account in the planning of collaborative research if the issues of concern being addressed are not only of UK origin but of relevance in overseas countries where business is being sought.

5.4 Science

5.4.1 Overall, the sub-programme scored well in terms of its scientific aspects. Although much of the scientific work is technology or engineering related, and perhaps often not research in the strictest sense, the majority of the work was soundly carried out and achieved worthwhile results. The dominant contractor, WRc, generally scored highly but in later years, where a broader spread of contracting organisations have been employed, there were no particular salient characteristics that could be related to one contractor type or another revealed by the evaluation process. It should be noted that WRc is no longer the dominant contractor to the programme but tenders competitively for projects alongside other contracting organisations.

5.4.2 The arguments advanced for maintaining centres of excellence partly as a result of funding from a research programme of this type are problematical. Such a centre has been established at WRc on the basis of a framework memorandum within which organisations (of which DOE is one) will make use of WRc as a jointly used national centre whose principal area of activity relates to aquatic aspects of environmental toxicology of chemical contaminants. The objective of this framework approach is stated to be for clients to achieve value for money and a consistently high quality of output in terms of (a) information from a nationally available source of data together with experience in its interpretation, and (b) related research by joint commissioning of work within one or more specific areas of expertise in which WRc has unique experience.

5.4.3 The dangers of such an approach are that it will establish single tender action as again a basis for the placing of work with a particular research supplier. This could endanger the developing role of an intelligent customer establishing an appropriate research needs agenda to be fulfilled by the best available contractor. Those favouring the centres of excellence approach would argue that it is to the advantage of the research customer to have centres of excellence available offering capability related to the solution of their problems. The contrary view is that a centre of excellence should be able to sustain the excellence of its capability through funding of work by a portfolio of funders and types of project. If it cannot do that, its centre of excellence standing is scarcely validated. The Review Team do not take the view that a funding programme such as that of the sub-programme managed by DWI has a responsibility, shared or otherwise, to maintain national centres of excellence. Rather it is the purpose of those managing the programme not to have as an objective the preservation of such strengths but to capitalise on them to achieve their own objectives.

5.4.4 A characteristic of the Area E sub-programme is its essentially responsive and tactical nature. The research responds to issues and concerns that arise, seeks specific answers to them and often adds further contracts as other questions emerge. There is no real evidence of funding forward-looking strategic research to create an asset base of information and experience in key areas despite the provision of one objective of the Programme that addresses fundamental research. In practice, there has been little

scope, as a result of funding constraints, to fund research of this type no matter how desirable. Although some argue strongly for the provision of longer term strategic research funding underpinning the activities of the Inspectorate (and other areas of the Water Directorate), others feel it is no purpose of such a funding programme to sustain a strategic position. They would argue that the accumulating portfolio of well implemented tactical projects itself provides in aggregate the asset base that it is argued needs to be created by a strategic research element. It is argued further that there are other funding lines available to research contractors to enable them to undertake longer term strategic research of this nature on drinking water issues so providing an asset base for themselves which gives a competitive advantage in tendering procedures.

5.4.5 Such a philistine approach to strategic research is not entirely credible. If government is not to undertake longer term thinking informed by strategic research, it is questionable who will. Any initiative in this area would certainly require tight specification. Strategic research should not be seen as a means of pursuing entirely curiosity-driven research at the whim of the research contractor. There is no reason for believing that tight specification should not be possible; nor for thinking that strategic research *per se* is inappropriate to a targetted and focussed government research programme. Other departments fund strategic research, for example MAFF and ODA, and the Department of Transport has recently initiated a seedcorn research programme.

5.4.6 A possible way forward in this area would be to define initially what the strategic needs of drinking water research are. What are the issues in drinking water beyond the year 2000 that those involved in its regulation and its provision will need to address and for which they will require information? Is longer term effort required in any of such sectors? For example, can biological contamination be predicted? Can leaching be modelled and hence predicted on the basis of the chemical composition of materials in the distribution system and the presence of disinfection by-products in the water it is carrying? Can satisfactory models be developed for risk assessment of both chemical and biological contamination relating to the treatment and distribution of drinking water? True, such areas might be left to academia and Research Council funding, but

it might also make sense for those who anticipate such future needs to initiate some research activity early on. Some research probing into what such needs are could be money well spent and might improve thinking across a range of related issues.

5.4.7 Further thought also needs to be given to the potential of collaborative research. There is a willingness on many sides to get involved and do it, but less certainty about how to go about it, how to define respective roles, and how to deal with the outputs. A ROAME approach needs to be taken to collaborative research so that it can be tightly specified, the various partners each know their role, what the rationale is, what the aim is, how the work will be managed, how it will be evaluated and what will happen to the outputs when it is completed. Again, developing thinking in this area could be assisted by a desk study undertaken through an external contractor.

5.4.8 Those involved in the appraisal of the programme should be encouraged to think more laterally and beyond the present remit of water quality and health. Examples would be the inclusion of economic components in research projects so that assessments are made of the costs for example of new technology and standards and their implementation so that the BATNEEC approach (Best Available Technology Not Entailing Excessive Cost) underpins developments of this type in the drinking water sector. Similarly, the Inspectorate might take the view that research into aesthetic quality issues such as odour, taste and appearance also need to be addressed in the research programme based on the belief that the consumer will not be content to drink chemically and microbiologically safe water if its taste and its appearance are unpalatable.

5.4.9 Now that the burden of developing research ideas rests firmly with the customer, there is an increasing onus on DWI officials to develop a programme that meets areas of concern in a pragmatic way. Inviting external organisations to research planning meetings is a commendable course of action here and has been greatly appreciated. Nevertheless, the burden on internal officials remains and there will be an increasing need for them to maintain a state of the art knowledge in areas relating to drinking water.

5.5 Management

5.5.1 In the earlier years under review, the administrative procedures used in the Area E research programme were somewhat haphazard. In particular, it proved very difficult to track reports of research to project files recording its origination. Reports often had titles that were not the same as file titles and carried various numbers which, on many occasions, did not correlate with file or other project and contract numbers. Project numbers themselves sometimes existed in duplicate for completely different topics of research; in other cases files could not be located at all, and in some cases neither could reports. Some projects evolved into others without clear recognition that this had occurred, either in reports or on file. Titles could not only be ambiguous but misleading. Some project files related to contracts generating perhaps 12 or more reports yet there was nothing in those reports to link them together or on file to demonstrate their accountability to the contract.

5.5.2 Procedures in the last three years are much improved though there is still a need for a clear schedule and definitive code number which stays with a project from its inception to the production of output reports. There must be clarity and consistency as to whether numbering procedures refer to projects, contracts or reports and the schedule must state the originator of the work (at the research ideas or research programme meeting), the contracting organisation, contact names, addresses and telephone numbers, the financial size and invoicing of the project, linked reports and/or files, and accumulated information on the availability of interim and final reports, their production, acceptance and distribution.

5.5.3 It is essential that there is a database of project activity in the programme. The present database of reports is not satisfactory although it is recognised that it is better than previously when no overall programme information could be accessed. The database must be searchable by key features such as origination, size, contractor, duration, timing and report availability. A sensible tabular format for projects in the research programme is already on file as the Water Directorate Research Programme Area E 1995-96 that gives sub-divisions into which the various projects fit, their start and end date, their cost per financial year, whether they were single tender action, and

comments. This format is now apparently implemented routinely as part of the DOE research contract management database (known as PACT). It must be adhered to consistently in the future so that project information can be supplied to interested or auditing parties that is better than that provided to the present Review Team. Ideally, the searchable database should be available through the Internet. Such administrative refinement will not happen unless it is resourced and it is recognised that DWI officials may not have the resources necessary to provide the implementation. If so, the process of establishing a properly structured searchable database and record of programme activity should be contracted out.

5.5.4 The appraisal of the research programme is now established using procedures that are truly needs-led in relation to policy concerns rather than reliant on PIFs supplied by potential research contractors. This is to the credit of DWI officials and is further reflected in the change in objectives of the Programme since 1993. However, the Review Team did have some difficulty in interpreting the appraisal procedures. The process is either not yet firmly established and still evolving or is not very transparent even internally. The timing and the naming of the key meetings at which decisions on future research funding are taken was not always easy to discover. They need to be clearly identifiable and set out as a flow chart. In this way, the appraisal process will be clear to all who have an involvement and eliminate the confusion that some, particularly from external organisations, clearly feel.

5.5.5 It could be advantageous to take this process even further and hold prior discussions, certainly with outside organisations who commented that despite their input to programme appraisal they were not always "sure what they were getting" particularly if it related to potential collaborative work. A forum on research needs in particular areas such as has been undertaken on groundwater research needs in the UK would represent a useful format.

5.5.6 As indicated elsewhere, there are difficulties assessing the benefits of the research programme to the activities of the Inspectorate when the research programme funding is dependent on allocation of a proportion of the Water Directorate Research Programme funds. It is not sufficient for government to assume that because a strong privatised industry exists which is showing an increasing propensity to fund research in its own right then there is a decreasing requirement for research capability to support regulation. Indeed, if this is the policy, it should be clearly stated so that the form of research undertaken can be adjusted accordingly. If it is not, it might be argued cogently that increasing research resources should be devoted to drinking water standards and regulation so that the weight of evidence is not simply in the hands of the supplier. One way of providing some flexibility would be for the DWI to be funded on a basis that includes a cost centre for the research programme and the Chief Inspector have the delegated responsibility for virement between the research programme and other areas of Inspectorate responsibility.

5.6 Dissemination and Impact

5.6.1 Although there are many reports in DOE as outputs from several years of research effort under the Area E sub-programme, their format and content is very variable in quality and indeed their external appearance usually indicates more to the reader about the research contractor than the funder. The need for a schedule on file embracing information on a research project from initiation to dissemination of its outputs has already been dealt with in Section 5.5. As important, is a consistent approach to the production of the research outputs themselves. DWI needs to set out the basis upon which this is to be done so that not only does the research activity managed by the Inspectorate have an external face reflecting the Inspectorate's involvement, but the quality of the reports, which itself is quite variable, will be improved by specifying clearly what they should contain and how they should be assembled.

5.6.2 The comment was made that workshops are more useful as a communication vehicle than printed material. Workshops have indeed been held on individual items of research activity and findings, but an annual workshop reporting aspects of the Area E sub-programme would create further awareness of the research activity managed by

the Inspectorate which itself could help in justifying the fast decreasing amounts of research funding available and striving to reverse this trend. In other words, the research programme needs to be marketed better if it is to maintain or improve on its current levels of activity. The workshop could also be a means of advertising and indeed selling research reports and other material generated from the research. Where these other materials have drawn heavily on the outputs of research projects, due recognition of this should be given so that it is clear to the reader what the origin of the information is.

5.6.3 DWI should contemplate the production of a newsletter, perhaps half-yearly along the lines of the AWWA Research Foundation Drinking Water Research Bulletin. This could provide listings and brief descriptions of research projects in an easily readable format. As mentioned previously, databased project information and report information could be made available via the Internet.

5.6.4 It is recognised that the resources of DWI are perhaps insufficient to properly implement some of these dissemination initiatives. However, they could be contractually specified and resourced by an outside organisation on behalf of the Inspectorate. Use is already made of the FWR in relation to dissemination of information but the extent and specification of this seems to be vague. The principle, however, could be made use of as the basis of a more tightly specified contract which also takes into account use of library abstracting systems and on-line access systems, and similar ways of bringing the outputs of the research programme to the attention of a wider, interested audience.

5.6.5 DWI officials need to institute better measures of take-up and impact of the research programme that they manage. Studies should be commissioned making use of the research budget so that specific impacts can be listed, categorised, and quantified providing evidence of the value of the research programme itself.

5.6.6 There is also a need for public education on risks relating to drinking water. The public needs to be aware of the costs of eliminating risks and what the extents of the risks are. Without such awareness, or at least readily accessible information, there is a

danger that a gullible public will increasingly seek safer water at any price only to complain when the price becomes more and more burdensome. There is little point in having a regulator tasked with watching price issues and another one tasked with watching quality issues, if, in the public mind, they are likely to pull in different directions and the public has little information on which to judge the relative merits of the arguments.

6. CURRENT POSITION AND FUTURE DIRECTION

6.1 Programme Content and its Management

6.1.1 The science that has been reviewed under the programme during the period 1987-95 represents a body of sound, solid work which in the main produced useful and relevant information. There were individual exceptions to this overview of the programme, but they do not greatly influence the broad assessment. Overall, the nature of the science is short term and, at times, hardly innovative and significant elements of it are either engineering or analytical approaches which generated data. The flavour of the work, therefore, is not one of being at the cutting edge of scientific advancement, but this does not detract from its usefulness in relation to Departmental policy concerns and Inspectorate functions.

6.1.2 It is certainly true that some aspects of the work represent continuing and substantial effort, but even where this is the case, the pattern is one of a portfolio of shorter term projects rather than the fulfilment of an overarching strategy delineated at the outset. It is also true that in some areas, such as *Cryptosporidium* projects, genuinely innovative work has been undertaken. Nevertheless, the overriding impression remains that the culture of the programme is not one of the excitement of operating at the frontiers of science, but a solid and useful contribution to knowledge in a particular area. This is not an unexpected finding and, for a research programme of this type, such an outcome should be seen as satisfying what is required.

6.1.3 In the period under review, there was a major dominant contractor to the programme, WRc, but this dominant influence was not detrimental and in the main the performance of this contractor was of good quality albeit stronger in toxicological and analytical fields than in engineering fields.

6.1.4 WRc is now only involved through the competitive tendering processes that are the norm for resourcing the programme. This is at it should be and large experienced contractors must rely, in these processes, on their intrinsic competitive advantage. Although the argument for underpinning centres of excellence is recognised, for the

purposes of this research programme it is inappropriate that such a responsibility should be accommodated. Better value for money for the taxpayer is more likely to be achieved through competitive tendering than through any arrangements which underpin the resourcing of a supplier of research services in order to maintain its excellence. This is an issue for the research supplier to address rather than the customer and its solution rests in achieving a large and varied portfolio of work.

6.1.5 The management of the programme is increasingly effective. Administrative failings (certainly pre 1993) have been corrected, though some refinements to assist external use and survey of the programme still need to be put in place. Specific examples are identified in Section 5.5.

6.1.6 The move to identifying genuine needs to be addressed by the research funded under the programme as distinct from reacting to proposals put forward by research suppliers is in line with policy relating to government R&D programmes generally. Such a move, though difficult to implement, has been made by the Inspectorate officials involved in managing the programme and they are to be congratulated for grasping this issue and achieving the necessary change of culture. The appraisal process could still benefit, however, from greater clarity relating to its mechanics and the expectations for input from those increasingly involved. It is not sufficient simply to have representatives of a broader spread of organisations present during an appraisal process. It is also necessary to be clear as to what their responsibilities are, how those relate to the research programme, and what their input to its appraisal is therefore likely to be. This will undoubtedly be helped by better articulation of the rationale and objectives of the research programme as discussed in 6.3 below.

6.1.7 Dissemination of information from the research programme and assessment of the impacts of those outputs is still too passive. Ways must be found of improving awareness of activity within the research programme and better establishing its corporate identity so that such activities achieve wider recognition. Some specific aspects that require improvement are set out in Section 5.6. If the research programme is to be valued by professionals and organisations constituting the drinking water community it ought to be portrayed as if that community represents its

stakeholders. To achieve this culture of involvement it is not appropriate to consider the research programme as simply a sub-component of wider research programmes within DOE. This is particularly important in a situation of declining research funding. This decline should not be allowed to continue and indeed needs to be reversed. External stakeholders could bring influence to bear here.

6.2 The Range of Involvements

6.2.1 A striking feature of the Water Quality and Health Research Programme is the range and variety of involvements within government and outside it. This is surprising in view of its modest size, but indicates the complexity of drinking water issues and the involvements and concerns of many bodies relating to the appropriate provision of safe water to drink for the population. Indeed, the universality of this supply is more extensive and life sustaining than that of food for which substantial R&D public funds are expended.

6.2.2 With such a range of involvements it is reasonable to ask who really is the customer for this research programme. To an outsider, the answer to this question is not clear. Even within DOE the programme represents one component only of a Water Directorate Research Programme which itself is a component of an Environment Protection Group Research Programme. The importance of drinking water in the public mind therefore is scarcely reflected by the hierarchical standing of a government research programme designed to address it. This component of the Water Directorate Research Programme, is managed, for reasons of technical and administrative convenience, by the Drinking Water Inspectorate which is itself tasked with wide ranging regulatory responsibilities in relation to the provision of safe drinking water. The research programme, however, responds to WS Divisions' policy concerns though it is true that DWI requirements underpinning the regulation of the water industry are usually accommodated. This duality of ownership responding to policy concerns of the Water Services Divisions of the Water Directorate, on the one hand, whilst being executed by the Drinking Water Inspectorate as a division of the Water Directorate on the other, results in ambiguity. This is especially so outside government, and even outside DOE, when those involved have little familiarity with the way in which the

Departmental structure operates. It is fair to question whether this duality of ownership is an effective position for the research programme.

6.2.3 Within government more broadly there is a diversity of drinking water issues. The Department of Health has to be an important player, but though supportive to the programme it contributes no public funds directly to drinking water research either through the Water Quality and Health Research Programme in DOE or elsewhere. It is recognised, however, that there are indirect involvements in research activity through NHS/PHLS. Concerns relating to drinking water standards can arise through epidemiological information as a result of community medical procedures and resulting public health laboratory investigation or surveillance. PHLS also has its own involvements through appropriate advisory committees on drinking water research issues and yet, interestingly, it is also a contractor to the programme.

6.2.4 The Ministry of Agriculture, Fisheries and Food has another range of involvements relating to drinking water research which are perhaps more specifically focussed at the present time on *Cryptosporidium*, but more widely embrace environmental impact issues of farming and the agricultural industry generally. Here a defensive position in relation to their interests might be adopted regarding drinking water standards and regulations. Other government bodies involved include the Scottish and Northern Ireland Offices (where provision of drinking water to the consumer is undertaken quite differently from that in England and Wales); the Environment Agency; and the Office of Water Services.

6.2.5 Outside government, the privatised industry in England and Wales is represented by WSA and its contracting arm, UKWIR Limited. There are also involvements with contractors both private, in government, and academic as well as research organisations in the water sector including WRc now itself privatised.

6.2.6 Outside the UK there are involvements at a policy level with partners in the European Union and with European Commission officials, though at present collaborative research effort within the EU is poorly focused and more effort is needed to bring added value to the research endeavour despite the resulting negative impact of attribution on UK government research funding..

6.2.7 There is a real need to specify the roles and interfaces of those with involvements with drinking water issues. The appraisal of the research programme has been widened to embrace their input and this is a very praiseworthy move, but it is not sufficient to have representatives of different organisations involved in research appraisal if their different interests and their own agendas are not clear to all. The operator/regulator interface is important in relation to new standards and methodologies, but the different interests of both parties must be well articulated not least because of increasing disparity between the R&D spend of the privatised industry and the regulator. If this disparity continues it might ultimately compromise the regulator's position. Interface differences are perhaps less focussed at a policy level where defence of the UK position by DOE policy officials in relation to EC Directives is supported and indeed welcomed by industrial operators.

6.2.8 Increased contact and involvement with organisations such as the American Water Works Association Research Foundation by both the privatised industry and DWI officials representing the Water Quality and Health Research Programme is to be welcomed. It can provide a forum through which issues can be discussed and research undertaken at a distance from the positioning of the UK organisations involved.

6.3 Rationale

6.3.1 At present the rationale for the Water Quality and Health Research Programme is not very clear and has to be inferred from a variety of inputs to, and impacts on it. In particular, the rationale in relation to the Water Directorate in DOE appears to be interpreted differently by different people perhaps because of its historical evolution. One view would be that the purpose of the research programme is to inform policy development in relation to the work of the Water Services Division of the Water

Directorate. Another view would be that the purpose of the research programme is to underpin the responsibilities of the Drinking Water Inspectorate where, amongst its main tasks, are specified:

- providing technical and scientific advice to ministers and officials of the Department of the Environment and Welsh Office on drinking water policy issues;
- identifying and assessing new issues or hazards relating to drinking water quality and initiating research as required;
- assessing chemicals and materials used in connection with water supplies; and
- providing authoritative guidance on analytical methods used in the monitoring of drinking water.

These tasks imply, or indeed specify, research requirements.

6.3.2 The rationale of the research programme where it impinges on other organisations with responsibilities or functions concerning drinking water is even hazier. Certainly, the rationale for involving such organisations should be specified so that the interface of drinking water research on their own areas of responsibility is spelt out. If such issues can be stated in simple terms, the appropriate functional response follows. For example, is the input of organisation X advisory or executive? Will the relationship delivering the research be collaborative or simply assistance with its specification or dissemination of its outputs? Such decisions cannot easily be made when rationales depend on individual interpretations. They have to be stated in a policy document.

6.3.3 This deficiency causes particular problems for a privatised industry looking for clear-cut areas of responsibility, resulting obligations and resourcing, and effective decision making particularly in relation to collaborative research endeavour. It would be very disappointing if emerging collaborative effort were to fail because of deficiencies that had their origins in management issues such as these.

6.3.4 Turning to the objectives of the research programme as currently defined in order to seek clarification of the programme's rationale is not particularly helpful. The objectives of the Programme are in fact areas of activity. Indeed the preamble in Annex A - Objectives of the Water Quality and Health Research Programme, says as much when it states that the four original arbitrary project areas "have now been replaced by the following subject headings". Although some objectives can be teased out of the ensuing paragraphs, other statements are not objectives at all but simply expressions of policy considerations.

6.3.5 Underlying all this obfuscation there is a distinct theme of activity underpinning the research programme that relates to **risk assessment**. Much of the effort expended concerns evaluation of risk and the standards, analyses, methodologies, and processes that should be in place to reduce risks from biologically or physically contaminated drinking water to acceptable levels however defined, and provide information relating to procedures which will manage the issues involved. If that is the raison d'etre for the programme it should be stated as such and subject areas such as those stated as the current objectives subordinated to it.

6.3.6 A new rationale therefore needs to be evolved for this research programme clearly stating its **aim**, the **purpose** of achieving that aim, the **objectives** to be reached in fulfilling the aim, and the **activities** to be undertaken in order to reach those objectives. Those with an input to this process can then have that input specified on the basis of their own areas of responsibility and the way in which those areas of responsibility impact on the aims, purposes, objectives and activities of the research programme.

6.4 Future Development

6.4.1 One possible *modus operandi* for the research programme in the future could be that of quality assurance in relation to research that others - in particular the privatised industry - undertake in order to ensure appropriate standards for the delivery of safe water to drink to the consumer. However undesirable this might represent a role for a research programme that is increasingly constrained by funding. The quality assurance role of the programme would mean that research undertaken by others was not

credible until it received endorsement of its effectiveness from the Inspectorate. Research activity in the programme is then limited to that which provides this validation.

6.4.2 This is not a mode of operation that should be adopted lightly as there are inherent dangers that withdrawal from active research participation through the research programme by the Inspectorate will damage its credibility. The risk is that increasingly the force of the argument will rest with those who are active players in undertaking the research itself. It does, however, provide an avenue of last resort for the rationale of the research programme if it continues to be placed under financial constraint so that it risks operating as a research endeavour that is seen to be in the shadow of research programmes undertaken by the privatised industry or other players.

6.4.3 A more positive approach would be to reformulate the research programme in a way that gives it an improved identity, underscores its importance to the drinking water community and the respective stakeholders in that community, and communicates its findings in a dynamic way.

6.4.4 One way of doing this would be to rationalise the research programme on the basis of the remit of the Inspectorate itself and the tasks it has to undertake. If a research programme, operating with that remit, is not sufficient to satisfy Water Directorate policy needs, an individual policy component of the research programme, specified from that customer standpoint could be encompassed within it.

6.4.5 It is possible at present to identify aspects of the programme that underpin regulatory activity and which could therefore be seen as those within the remit of the Inspectorate as customer and those which underpin policy issues which could be seen as within the remit of the Water Services Division as customer. In the former case, there is likely to be a developing relationship with the drinking water industry towards collaborative research; in the latter case advice would be provided from others in government to assist in the specification of the research to be undertaken. A further component of the programme might be an element of strategic thinking identifying growing or emerging

problems, approaches to dealing with such problems, and selectively addressing such problems through research projects of a somewhat longer term nature.

6.4.6 The interface between regulatory activity and policy development should clearly be seen to be led from the Inspectorate and not within the research programme. The duality of role is then in the Inspectorate where dual responsibilities currently reside with the Chief Inspector and not in a research programme whose customers are policy needs, but whose management is provided by technical regulators.

6.4.7 The appraisal of the research should be broadly along the lines which have now been initiated but clarified as to process and involvement in the way set out in 6.1 and 6.2. The programme would be managed as now, by officials of the DWI but with some adjustments to administrative procedures.

6.4.8 Collaborative research, in particular with the privatised industry, should be fostered using a rationale developed for this purpose based on a "need to know" principle to which the collaborators can subscribe with clear definition of their respective roles in terms of the specification, management, and ultimate use of the research outputs.

6.4.9 Collaborative research with European partners should be developed urgently as a result of initiatives taken by officials or perhaps better through tasking an external contractor with a recognised professional independence. Such a contractor could promote such initiatives as market research on needs in different member countries of the EU, likely approaches to dealing with such needs, the specification of the requisite contracts, and the formulation of procedures or steering groups to facilitate the collaborative process.

6.4.10 An independent contractor could also be tasked to investigate the need for strategic research effort on emerging issues within the drinking water sector. Such strategic issues should have a clear contextual position relating to both the consumer and operational concerns with drinking water rather than the overtly technical and specific project approaches currently found in much of the research programme. A more contextual approach to the research (which could also be added to some tactical

projects with benefit) should embrace economic issues particularly in relation to "best available technology not entailing excessive cost".

6.4.11 An outside contractor might also be tasked with another clear need relating to the research programme which is to improve the dissemination of the research outputs and accumulate evidence on their impact. In particular a corporate identity must be apparent in the outputs of the research programme in order to improve its awareness, its acceptance, and ultimately its funding.

6.4.12 These aspects of improved rationale, clearly identified interfaces, research on strategic needs, a broader context to research, stimulus to European collaboration, clearly defined collaboration between regulator and supplier, information on impacts of research, and improved dissemination and communication with users, represent a preferred model for the research programme to that of simple quality assurance. Use of outside contractors to service some of these requirements is proposed because the resources required are not available in DWI. It is recognised that there is a cost to scarce research funds in such an approach. However, it is largely a one-off cost and the eventual benefits to the research effort should outweigh the costs involved. The further alternative of leaving the programme as it currently stands is not really viable. It is unlikely that it can exist in its current form for very much longer if it is to retain influence in the drinking water community.

6.4.13 Given that the Water Quality and Health Research Programme develops in future along the preferred path, it would be appropriate to rename it the Drinking Water Research Programme.

7. CONCLUSIONS AND RECOMMENDATIONS

7.1 The Water Quality and Health Research Programme has generated some sound science which overall has provided reasonable value for money. Some contractors have given a disappointing performance, but these have been the exception. In the main, the range of contractors has performed satisfactorily. The dominant contractor in the Programme, WRc, performed well, but the work undertaken in relation to toxicology and laboratory analysis generally was more impressive than the engineering work. There have been some marked successes in the science, notably in *Cryptosporidium* research and work undertaken on disinfection by-products.

7.2 The management of the Programme is good and certainly much improved in the last three years. The impact of new personnel dealing with the programme has been very noticeable. Competitive tender is now the norm leading to a more robust approach to the science and its delivery. Administration of the programme is better than it was prior to 1993 when there had been some serious lapses. There is still room for improvement in relation to correlation of projects and reports, an appropriate searchable database, consistent numbering format, and an appropriate recording procedure in the form of a schedule setting out key information that remains with the project information throughout its life from proposal to output. Format of reports should also be specified so that as far as possible they are consistent and comparable in layout and appearance.

7.3 The appraisal stages of the programme are now much better having moved away from the PIF approach from research contractors to a specification of needs, firstly in an ideas meeting, then a Research Programme Planning Meeting and finally a sift when the funding level is known. Extending inputs to the appraisal process from outside organisations involved with drinking water is to be commended. However, the procedures used should be clarified preferably in the form of a flowchart identifying meetings, their titles and timing. The roles of those involved and the reasons for their involvement need to be stated clearly.

7.4 There is satisfaction to be taken from the increasing move towards research collaboration with the privatised industry. Interaction here has improved noticeably as a result of efforts by DWI officials and others for which they should be congratulated. There have also been praiseworthy international initiatives involving joint research and exchanges of information which it is hoped will continue.

7.5 Dissemination of output material from the research programme still has some way to go before it can be deemed to be really satisfactory. At the moment, it is rather passive, somewhat patchy or serendipitous and there is a widespread lack of awareness of the totality of the programme in the world outside. Certain aspects of the dissemination process need attention such as a corporate style and format to reports, use of electronic information sources such as the Internet, the holding of annual or targetted workshops, the availability of abstracts of reports perhaps through on-line systems and clear listings or databasing of research projects that are both active and completed. There also needs to be better recording of the impact of the research and stated recognition of the fact that those impacts have a research origin when this is the case. A desk study of such impacts could be commissioned from an outside contractor as indeed could a good deal of the dissemination resourcing that is required.

7.6 One aspect of research collaboration that is disappointing is that with Europe despite the fact that the policy concerns generated through emerging EC Directives constitute an important needs dimension for the research programme. European collaboration, it is recognised, can be difficult and time-consuming and has Europes research funding implications through attribution. Also there are differences of approach in relation to drinking water between member states that have a fundamental effect on the prioritisation of various issues. Nevertheless, drinking water suppliers/ operators in Europe are steadily coming together and member government organisations must do the same. A greater effort is required here if some added value is to be achieved. Some work between different Directorate-Generals in Brussels may well be necessary to further any such initiative. Because of national sensitivities it might be advisable initially to specify an approach to European research collaboration on drinking water issues that could be undertaken under contract by an independent professional body.

7.7 The programme needs an improved rationale which embraces the duality of its function - implicit rather than stated - of underpinning regulatory standards and procedures whilst informing policy as a result of research activity. The locus of the one in the Water Services Division of the Water Directorate, and the other in the Drinking Water Inspectorate who manage the Programme and provide technical advice, to an outsider sit uncomfortably together and the rationale of this arrangement should be clarified or, better, reviewed and replaced with something more logical set out in a policy document.

7.8 Present objectives of the research programme do not represent objectives as such, but rather indicate areas of activity. They need revision based on a clearly stated **aim** and **purpose** for the research programme, with a section setting out the **activities** to be embraced by the programme in order to meet the **objectives**. Such a research strategy statement could be issued in conjunction with the research policy statement alluded to in 7.7. It would be valuable if it could also contain reference to a dissemination strategy based on some of the issues identified in 7.5.

7.9 There is a case for considering the need for a strategic research element to the research programme. As a start, market research should be undertaken to see what longer term strategic needs exist in the drinking water sector. Some of these such as risk perceptions, costs, and aesthetic acceptability of safe water to drink may well be outside the current remit of the programme as it relates to water quality and health and require a different context. Again, market research on strategic needs could be the subject of a well specified study done under contract.

7.10 Some of these changes in direction and emphasis have been taken into account in a new ROAME statement which is provided as Appendix 8. Acceptance of these changes would mean that a more appropriate name for the Water Quality and Health Research Programme in future would be the Drinking Water Research Programme.

7.11 Based on the above conclusions and the analysis and strategic direction set out in Sections 5 and 6, it is RECOMMENDED that the following specific actions are taken:

(i) **Produce a research policy statement dealing with the rationale of the Water Quality and Health Research Programme, the needs of DWI and, more broadly, the Water Directorate and the interests of those with other involvements, both inside and outside government.**

(ii) **State clearly the aims and objectives for the research programme and outline its operational characteristics relating to advice it seeks on research needs, the way in which it implements its research, and how it collaborates with others.**

(iii) **Produce clear administrative guidelines on the appraisal of the Programme containing (a) a flowchart of the process, and (b) a description of those involved in it and their input.**

(iv) Improve administration by:

- **databasing projects, interim and output reports in a suitable and consistent format;**
- **producing a tabulation of completed, current and new projects indicating tender action, size, contractor, and key contacts and other relevant information so that an overview of the research programme can be gained quickly;**
- **devising a file project schedule containing basic information on reference number, title, size, start and end dates, contractor, appraisal process, dissemination outputs, their distribution and number, in a consistent way in a recognisable format that stays on file with a project from proposal stage until final outputs on completion;**
- **specifying a format for reports and other communication products that give a corporate identity to DWI.**

(v) Improve the dissemination and uptake aspects of the Programme using outside contractors to resource dissemination responsibilities. These responsibilities should involve:

- using a corporate style for all research reports;
- a circulated listing of such reports;
- a half-yearly newsletter dealing with drinking water research;
- holding an annual and more targetted workshops;
- use of the Internet to provide information on the research activities in the Programme; and
- the provision of reports and executive summaries of reports (both in hard copy and on-line).

(vi) Commission a study on the impact of a range of research outputs.

(vii) A study should be commissioned on likely strategic research needs relating to drinking water beyond the year 2000 and the ways in which such strategic research needs could be addressed.

(viii) Maintain the present management procedures for competitive tendering of research projects specified against pre-identified needs.

(ix) The Water Quality and Health Research Programme should be renamed the Drinking Water Research Programme with the newly adopted ROAME statement provided in this report which takes account of the changes identified and recommended.

APPENDICES

APPENDICES

APPENDIX 1

OBJECTIVES OF THE WATER QUALITY AND HEALTH RESEARCH PROGRAMME

A PRE 1993

B POST 1993

WATER QUALITY AND HEALTH R&D SUB-PROGRAMME RESPONSE TO REVIEW

Formal Position

DOE research sets out to answer questions that Ministers ask when formulating policy. This statement recognises that DOE Ministers are responsible to Parliament and to British and European Courts on questions of water supply quality which effect human health.

The basic divisions of responsibility are:

medical aspects of health affected by pollution - DHSS

nature, sources pathways and exposures of man to pollutants in the environment. This includes policies and standards to meet current UK and EC legal requirements - DOE

actions including practical measures to meet these policies ie new treatment plant - water undertakings.

Broad Objectives

The sub-programme is designed to identify and assess health risks of organic and inorganic compounds in drinking water: the means of assessing chemical and microbiological quality and related treatment processes including the requirements of the EC Drinking Water Directive; and the assessment of risks to quality of ground water resources.

Detailed Areas of Research

E1 Health Risks from Organic Micropolutants in Drinking Water

This area of work is designed to assess, using biological and chemical tests the risks to consumers from trace organic substances in drinking water; to identify highly mutagenic or toxic substances, to determine whether they occur naturally or how they are derived as a result of disinfection processes; and to assess the effects of distribution on organic contaminants.

E2 Requirements of the EC Drinking Water Directive

The objectives are to provide data to support derogations under the EC Drinking Water Directive; and to investigate effects on the quality and potential risks to health of imposing specific treatments to comply with particular quality parameters of the directive.

E3 Inorganic Constituents of Drinking Water in Relation to Health

This area seeks to determine that the quality of water to consumers presents no health hazards and is acceptable as wholesome water with respect to inorganic constituents derived from the source of water or passage through the distribution system or in-house plumbing.

E4 Microbial Contamination- Assessment and Treatment

This area considers potential health and water quality problems associated with microbial contamination of water supplies; of gaps in knowledge of the nature, behaviour and consequences of microbial contamination of supply systems; and of the need to evaluate means of controlling microbial contaminants.

E5 Methods of Assessing Water Quality and Health Risks

This work reflects the need and demand for consistent and reliable methods of identifying, analysing and measuring contaminants; of assessing associated health risks; and of measuring the performance of treatment processes for monitoring purposes and for reference in the case of legal disputes. This also supports the SCA.

E6 Groundwater

This work supports the protection of groundwater from contamination and the monitoring of ground water quality.

Assessment of priorities and projects

The relative risks to health from various contaminants in drinking water shall be assessed annually between DHSS and DOE.

This review shall be taken into account by the programme committee when formulating the sub-programme.

Monitoring of Results of Projects

The WD value for money review of completed research contracts will be undertaken for all projects.

Re-Evaluation of Sub-Programme

The sub-programme shall be re-evaluated in five years time (1993).

WT
January 1988

Annex A - Objectives of the Water Quality and Health Research Programme

The Area E programme was formerly divided into four arbitrary project areas: health risks from micropollutants; compliance with the Drinking Water Directive; assessment of microbiological contamination; and methods of assessing water quality and health risks. These have now been replaced by the following subject headings which more closely reflect current policy concerns.

Regulatory obligations (a) European

This comprises research to support the UK input to the review of the Drinking Water Directive and to assess the significance of the revised WHO guideline values for drinking water. The UK line is that any review of standards should be based on sound science; failure to generate sound science leads to uncontested adoption of the precautionary principle, with subsequent implications for costs in regulation and treatment.

Regulatory obligations (b) national

In advising the Secretary of State whether water companies are meeting regulatory requirements it is necessary to periodically review the requirements to assess whether the correct balance exists between the need to protect the consumer and the costs that must be paid for that protection. There is a related concern that the Inspectorate must keep abreast of water quality and health issues if it is to advise whether water company investment proposals reflect a balanced view of risks and future obligations. Research is also necessary to ensure that the Secretary of State is fully informed when approving the use of substances and products in contact with water supplies.

Support for European standards work

DWI provides scientific and technical input to the Department's programme of supporting work in CEN and ISO. Failure to effectively support standards work will lead to loss of export potential and possible imposition of unnecessary regulations and restrictions on industry.

Fundamental research

It is desirable that DWI has the facility to commission a small amount of basic research, not necessarily related to any current issue. Such research is already carried out and tends to look at problems on the horizon or to fill gaps in current knowledge.

APPENDIX 2

LIST OF PROJECTS AS PROVIDED BY DWI

ANNEX B

Printed 02/01/9

ST OF CONTRACTS FOR DRINKING WATER QUALITY
MPLETED BETWEEN 01/01/87 AND 31/12/95

)054 7/7/095 WR 7/3/17
FECT OF DISTRIBUTION ON ORGANIC CONTAMINANTS IN POTABL
TER
art Date 01/08/83 End Date 30/09/89 Total Contract Amount
ntractor WRC CONTRACTS PLC

)110 7/7/117 WR 7/3/30
TERIORATION OF ASBESTOS CEMENT WATER MAINS
art Date 01/05/84 End Date 30/04/88 Total Contract Amount
ntractor WRC CONTRACTS PLC

)111 7/7/122 WR 7/3/31
ENTIFICATION OF MUTAGENS IN POTABLE WATER
art Date 01/05/84 End Date 31/03/90 Total Contract Amount
ntractor WRC CONTRACTS PLC

)129 7/7/137 WR 7/3/34
fects of disinfection on organic substances in water
art Date 01/10/84 End Date 31/03/95 Total Contract Amount
ntractor WRC CONTRACTS PLC

)135 7/7/138 WR 7/3/35
CTROLYTIC GENERATION OF CHLORINE FOR DISINFECTION OF
VATE SUPPLIES
rt Date 15/10/84 End Date 31/12/89 Total Contract Amount
ntractor UNI OF NEWCASTLE ON TYNE

)149 7/7/120 WR 7/3/32
ERIORATION OF WATER QUALITY IN DISTRIBUTION SYSTEMS
rt Date 01/07/84 End Date 31/03/91 Total Contract Amount
ntractor WRC CONTRACTS PLC

)150 7/7/160 WR 7/3/46
TERIOLOGICAL SAMPLING AND ANALYSIS
rt Date 01/04/85 End Date 31/03/87 Total Contract Amount
tractor WRC CONTRACTS PLC

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155 7/7/175 WR 7/3/50
ERFERENCE EFFECTS IN FLAMELESS AA'S
rt Date 25/09/85 End Date 31/03/87 Total Contract Amount
tractor SAC SCIENTIFIC

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159 7/7/168 WR/7/3/47
OF CYTOXICITY ASSAYS FOR ASSESSING TOXICITY

Start Date 01/04/85 End Date 30/04/88 Total Contract Amount
Contractor WRC CONTRACTS PLC

CW0173 7/7/097 WR/7/3/52
ESTABLISHMENT OF TRACE ELEMENT CONCENTRATIONS IN BRITISH AQUIFERS
Start Date 01/10/83 End Date 31/05/88 Total Contract Amount
Contractor HMPG (CREDIT NERC)

CW0174 7/7/002 WR/7/3/54
NITRATE POLLUTION IN GROUNDWATER
Start Date 01/04/80 End Date 31/03/89 Total Contract Amount
Contractor HMPG (CREDIT NERC)

CW0175 7/7/178 WR/7/3/57
ARSENIC, ANTIMONY, GERMANIUM, SELENIUM USING AA'S
Start Date 01/10/85 End Date 31/03/87 Total Contract Amount
Contractor UNIVERSITY OF LIVERPOOL

CW0176 7/7/176 WR/7/3/56
ELECTROTHERMAL ATOMISATION & DRAFT AA'S METHODS
Start Date 01/10/85 End Date 31/03/87 Total Contract Amount
Contractor YORKSHIRE WATER

CW0177 7/7/169 WR/7/3/51
GROUNDWATER NITRATE CONCENTRATIONS
Start Date 01/07/85 End Date 31/03/92 Total Contract Amount
Contractor WRC CONTRACTS PLC

CW0178 7/10/60 WR/7/3/53
SAMPLING OF GROUNDWATER WITH SPECIAL REFERENCE TO SALINE FRESHWATER CONDITIONS
Start Date 01/10/83 End Date 31/10/89 Total Contract Amount
Contractor UNIVERSITY OF BIRMINGHAM

CW0226 7/7/199 WR/7/3/63
ALTERNATIVE DISINFECTANTS TO CHLORINE
Start Date 01/06/86 End Date 31/08/87 Total Contract Amount
Contractor HMPG (CREDIT NERC)

CW0228 7/7/202 WR/7/3/64
GROUNDWATER POLLUTION BY ORGANIC SOLVENTS
Start Date 01/07/86 End Date 31/03/90 Total Contract Amount
Contractor HMPG (CREDIT NERC)

CW0229 7/7/205 WR/7/3/69
RECOMMENDATIONS FOR SAMPLING GROUNDWATER
Start Date 01/07/86 End Date 31/03/89 Total Contract Amount

ractor HMPG (CREDIT NERC)

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30 7/7/198 WR/7/3/62
L, SUPPLY SYSTEMS - EFFECT OF VARIABILITY OF RAW WATE
t Date 01/07/86 End Date 30/06/87 Total Contract Amount
ractor WRC CONTRACTS PLC

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31 7/7/206 WR/7/3/66
HUR HEXAFLUORIDE TRACERS FOR G'WTR TRACERS GROUNDWAT
SPORT STUDIES
t Date 01/10/86 End Date 30/09/89 Total Contract Amount
ractor HMPG (CREDIT NERC)

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50 7/7/204 WR/7/3/65
TILE & NON-VOLATILE ORGANIC COMPOUNDS
t Date 01/08/86 End Date 31/03/87 Total Contract Amount
ractor CES LTD

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57 7/7/207 WR/7/3/67
ATION OF COLIFORMS AND LEPTOSPIRA
t Date 02/01/87 End Date 31/03/88 Total Contract Amount
ractor PUBLIC HEALTH LAB SERVICE

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58 7/7/208 WR/7/3/68
FS AS MONITORS FOR HEAVY METALS IN FRESHWATER
t Date 01/09/86 End Date 30/04/87 Total Contract Amount
ractor UNIVERSITY OF DURHAM*

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53 7/7/214 WR/7/3/70
JATION OF NITRATE MONITOR AND CONTROLLER
: Date 02/02/87 End Date 30/11/88 Total Contract Amount
:actor AZTEC ENVIRONMENT LTD

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54 7/7/218 WR/7/3/71
:T OF NITRATE REMOVAL ON WQ IN SUPPLY
: Date 01/11/86 End Date 30/10/87 Total Contract Amount
:actor CES LTD

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55 7/7/216 WR/7/3/172
ROLLING GROUNDWATER NITRATE LEVELS
: Date 01/11/86 End Date 30/11/87 Total Contract Amount
:actor LAURENCE GOULD LTD*

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57 7/7/217 WR/7/3/73
ACTERISATION OF 2 UNIDENTIFIED CONTAMINANTS
: Date 05/01/87 End Date 04/07/87 Total Contract Amount
:actor CANTOCK ENTERPRISES LTD*

CW0282 1/9/019 DWI 70/2/7
Clostridia as Indicators of water treatment works' efficiency
Start Date 05/09/94 End Date 31/03/95 Total Contract Amount
Contractor UKWIR Ltd

CW0285 7/7/429
Assessment of monitoring requirements for drinking water
Start Date 01/08/93 End Date 28/02/94 Total Contract Amount
Contractor WRC CONTRACTS PLC

CW0290 1/9/017 DWI 70/2/5
Review of Microbiological Risk Assessment and Drinking Water Supplies
Start Date 01/09/94 End Date 30/04/95 Total Contract Amount
Contractor WRC CONTRACTS PLC

CW0291 7/7/370 WR 7/3/113
Improved materials testing procedures
Start Date 03/09/90 End Date 31/03/95 Total Contract Amount
Contractor WRC CONTRACTS PLC

CW0292 1/9/025 DWI 43/02/33
Identification of unknown organic substances in water sources and supplies
Start Date 15/09/94 End Date 28/02/95 Total Contract Amount
Contractor WRC CONTRACTS PLC

CW0297 1/9/041
A desk study into the reliability of mechanical backflow prevention devices
Start Date 18/11/94 End Date 31/03/95 Total Contract Amount
Contractor BSRIA

CW0298 7/7/428 WR 7/3/130
Performance testing of the method of analysis for microcystin lr
Start Date 20/01/93 End Date 20/07/93 Total Contract Amount
Contractor WRC CONTRACTS PLC

CW0300 1/9/010 DWI 70/2/4
Survey of Concentrations of Algal Toxins in Water Supplies
Start Date 01/07/94 End Date 30/10/94 Total Contract Amount
Contractor WRC CONTRACTS PLC

CW0316 1/9/011 DWI 70/2/1
Study of possible deterioration in water quality during summer months
Start Date 01/07/94 End Date 30/11/94 Total Contract Amount
Contractor Thames Water Utilities Lt

21 WR 7/3/34
NFECTION ORG SUBSTANCES IN DRINK WATER(2YREXT)
t Date 01/10/84 End Date 31/03/89 Total Contract Amount
ractor WRC CONTRACTS PLC

22 7/7/235 WR 7/3/78
OBIAL GROWTH ON MATERIALS IN CONTACT WATER
t Date 01/05/87 End Date 31/03/92 Total Contract Amount
ractor WRC CONTRACTS PLC

23 7/7/234 WR 7/3/80
CES OF PHENOLIC/CHLOROPHENOLIC TASTES IN DRINKING WA
t Date 01/07/87 End Date 30/06/89 Total Contract Amount
ractor WRC CONTRACTS PLC

26 7/7/233 WR 7/3/76
icides in drinking water sources and supplies
t Date 01/06/87 End Date 31/03/93 Total Contract Amount
ractor WRC CONTRACTS PLC

27 7/7/230 WR 7/3/77
ICULATE LEAD IN WATER SUPPLIES
t Date 01/05/87 End Date 31/12/91 Total Contract Amount
ractor WRC CONTRACTS PLC

28 WR 7/3/64
NDWATER POLLUTION BY ORGANIC SOLVENTS(1YREXT)
t Date 01/07/86 End Date 31/03/88 Total Contract Amount
ractor HMPG (CREDIT NERC)

31 7/7/237 WR 7/3/81
OGATE VIRAL INDICATORS
t Date 01/07/87 End Date 30/06/90 Total Contract Amount
ractor WRC CONTRACTS PLC

32 WR 7/3/52
E ELEMENT CONCS. IN BRITISH AQUIFERS(1YREXT)
t Date 01/10/83 End Date 30/05/88 Total Contract Amount
ractor HMPG (CREDIT NERC)

33 WR 7/3/54
ATE POLLUTION IN GROUNDWATER (1YREXT)
t Date 01/04/80 End Date 31/03/88 Total Contract Amount
ractor HMPG (CREDIT NERC)

:W0334 1/9/022 DWI 70/2/9
)etection of Toxin Producing strains of E;Coli
;tart Date 01/09/94 End Date 31/03/95 Total Contract Amount
:ontractor Strathclyde Water

:W0337 7/7/231 WR 7/3/77
3ACTERIAL DENITRIFICATION IN AQUIFIERS
;tart Date 01/06/87 End Date 31/03/90 Total Contract Amount
:ontractor HMPG (CREDIT NERC)

:W0338 7/7/228 WR 7/3/74
IUTAGENIC ACTIVITY OF CONCENTRATED WATER SAMPLES IN-VIVO
;tart Date 01/04/87 End Date 30/08/89 Total Contract Amount
:ontractor WRC CONTRACTS PLC

:W0343 7/7/364 WR/7/3/114
:VALUATION OF DRAFT SCA METHODS FOR THE DETERMINATION O
:HLORMEQUAT DALAPON CLOPYRALID TCA AMINO-S-TRIAZOLE SULCOFURON ETC.
;tart Date 07/08/90 End Date 15/02/91 Total Contract Amount
:ontractor SAC SCIENTIFIC

:W0345 WR/7/3/46
3ACTERIOLOGICAL SAMPLING AND ANALYSIS(2MEXT)
;tart Date 01/04/85 End Date 30/05/87 Total Contract Amount
:ontractor WRC CONTRACTS PLC

:W0346 WR/7/3/30
)ETERIORATION OF ASBESTOS CEMENT WATER MAINS(9MEX)
;tart Date 01/05/84 End Date 31/12/87 Total Contract Amount
:ontractor WRC CONTRACTS PLC

:W0348 7/7/236 WR/7/3/82
:VALUATION OF EFFICIENCY OF ALTERNATIVE DISINFECTANTS
;tart Date 01/06/87 End Date 30/06/92 Total Contract Amount
:ontractor WRC CONTRACTS PLC

:W0355 7/7/422 WR/7/3/128
'AH in drinking water - investigation of leaching
;tart Date 01/12/92 End Date 30/11/93 Total Contract Amount
:ontractor WRC CONTRACTS PLC

:W0359 7/7/430 WR 7/3/134
.eaching of lead from blue uPVC pipe
;tart Date 23/08/93 End Date 28/02/94 Total Contract Amount
:ontractor CES LTD

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162 7/7/254 WR/7/3/87
UATION OF DRAFT SCA METHOD FOR TOTAL TIN IN WATER
t Date 15/12/87 End Date 31/03/88 Total Contract Amount
ractor SAC SCIENTIFIC

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163 7/7/262 WR/7/3/83
UATION OF HPLC COLUMNS FOR IONIC CHROMATOGRAPHY
t Date 01/10/87 End Date 31/01/88 Total Contract Amount
ractor CANTOCK ENTERPRISES LTD*

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164 7/7/243 WR/7/3/84
RELATION OF HAZEN UNITS TO THE INTERNATIONAL CIE
UR SCALE.
t Date 03/08/87 End Date 03/11/87 Total Contract Amount
ractor KEITH MCCLAREN*

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165 7/7/270 WR/7/3/85
VAL OF RADIO-ACTIVITY DURING WATER TREATMENT
t Date 01/10/87 End Date 30/09/88 Total Contract Amount
ractor WRC CONTRACTS PLC

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167 7/7/255 WR/7/3/90
VALUATE CAPABILITY OF EXISTING SCA METHODS FOR
RMINING DICHLOROPROP, DINOSEB, DINOCAP,BENOMYL AND
O-S-TRIAZOLE
t Date 19/10/87 End Date 19/04/88 Total Contract Amount
ractor SEVERN TRENT WATER*

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168 7/7/269 WR/7/3/89
UATION OF RAPID CONFIRMATION TESTS FOR TOTAL COLIFOR
E. COLI
t Date 01/10/87 End Date 31/03/89 Total Contract Amount
ractor STRATHCLYDE R.C

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171 7/7/256 WR/7/3/87
UATION OF THE UNPUBLISHED ANGLIAN WA METHOD FOR
RMINING TRIADIMEFON IN WATER
t Date 19/10/87 End Date 14/12/87 Total Contract Amount
ractor STEVENAGE ANL CONSULTANT*

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182 7/7/265 WR/7/3/91
STIGATION OF THE DECOMPOSITION PRODUCTS OF FURAZOLID
t Date 04/11/87 End Date 12/02/88 Total Contract Amount
ractor WRC CONTRACTS PLC

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183 7/7/266 WR/7/3/83
UATION OF HIGH PRESSURE LIQUID CHROMATOGRAPHY ION
MATOGRAPHY OF TRACE METALS IN WATER
t Date 12/10/87 End Date 18/03/88 Total Contract Amount
ractor UKAEA (A.E.E.W)

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185 7/7/267 WR/7/3/93

DEVELOPMENT OF THE WRC METHODS FOR CHLORTOLURN, ISOPORTU
LUAURON, METHAM SODIUM AND METHYL ISOLHIOCYANDT AND CHLORMEQUAT
Start Date 02/11/87 End Date 15/08/88 Total Contract Amount
Contractor WRC CONTRACTS PLC

CW0402 7/7/303 WR/7/3/94
Biological denitrification - control of adverse side effects
Start Date 01/08/88 End Date 31/03/91 Total Contract Amount
Contractor WRC CONTRACTS PLC

CW0403 7/7/301 WR 7/3/95
Evaluation of suitable backflow prevention devices
Start Date 01/08/88 End Date 31/03/93 Total Contract Amount
Contractor WRC CONTRACTS PLC.

CW0404 7/7/302 WR/7/3/96
Development of gene probe techniques for coliform organisms
Start Date 01/09/88 End Date 30/06/93 Total Contract Amount
Contractor WRC CONTRACTS PLC

CW0406 7/7/304 WR/7/3/97
Nitrate reduction for protection zones by organic farming
Start Date 12/09/88 End Date 12/11/91 Total Contract Amount
Contractor PROGRESSIVE FARMING TRUST

CW0411 7/7/308 WR/7/3/98
Computer prediction of effects of water quality characteristics of denitrification by ion-exchange process
Start Date 14/09/88 End Date 14/01/89 Total Contract Amount
Contractor CRANFIELD I.OF TECH RMCS

CW0412 7/7/310 WR 7/3/099
Bacterial colonisation of treated water systems
Start Date 01/01/89 End Date 31/03/94 Total Contract Amount
Contractor CAMR

CW0426 7/7/323 WR/7/3/100
Groundwater storage in British aquifers: chalk
Start Date 01/01/89 End Date 31/03/90 Total Contract Amount
Contractor HMPG (CREDIT NERC)

CW0427 7/7/321 WR/7/3/101
Evaluation of SCA method for determination of Difenzoqua.....
Start Date 01/01/89 End Date 31/03/89 Total Contract Amount
Contractor SOUTHERN WATER

CW0428 7/7/319 WR/7/3/104
Evaluation of SCA methods for determination of Eulan

Mitin N, for Carbetamide and Carbendazin, for Propiconazole, and
hloridazon
t Date 01/01/89 End Date 30/06/90 Total Contract Amount
ractor NORTH WEST WATER AUTH

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29 7/7/320 WR/7/3/102
uation of SCA methods for determination of
roxyp and Dichlorofen
t Date 01/01/89 End Date 31/03/89 Total Contract Amount
ractor SOUTHERN WATER

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30 7/7/322 WR/7/3/103
uation of SCA methods for determination of
rothail and Propyzamide, Metamitron, Bromoxynil and Ioxynil
t Date 01/01/89 End Date 31/03/89 Total Contract Amount
ractor SAC SCIENTIFIC

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32 7/7/324 WR/7/3/105
fer protection studies using packer systems
t Date 01/01/89 End Date 31/12/91 Total Contract Amount
ractor HMPG (CREDIT NERC)

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45 7/7/334 WR/7/3/107
e deposits in water mains
t Date 01/08/89 End Date 30/06/92 Total Contract Amount
ractor WRC CONTRACTS PLC

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46 7/7/333 WR/7/3/106
ular activated carbon and microbiological quality
t Date 01/09/89 End Date 31/03/92 Total Contract Amount
ractor WRC CONTRACTS PLC

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51 7/7/339 WR/7/3/108
use pollution from land use practices
t Date 02/10/89 End Date 31/03/92 Total Contract Amount
ractor HMPG (CREDIT NERC)

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52 7/7/342 WR/7/3/109
fer protection specifications
t Date 02/10/89 End Date 30/09/90 Total Contract Amount
ractor HMPG (CREDIT NERC)

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53 7/7/341 WR/7/3/110
onal groundwater quality network and database
t Date 02/10/89 End Date 30/09/90 Total Contract Amount
ractor HMPG (CREDIT NERC)

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55 7/7/351 WR/7/3/111
rmination of cationic flocculants in drinking water
t Date 01/03/90 End Date 31/10/90 Total Contract Amount

Contractor

CW0459 7/7/357 WR 7/3/112
Cryptosporidia in drinking water
Start Date 03/01/90 End Date 31/03/94 Total Contract Amount
Contractor WRC CONTRACTS PLC

CW0468 7/7/379 WR7/3/115
Testing protocol and manual of guidance on application
of point-of-use treatment for private water sources
Start Date 01/05/91 End Date 31/12/92 Total Contract Amount
Contractor WRC CONTRACTS PLC

CW0470 7/7/382 WR 7/3/116
Economics of lead pipe replacement
Start Date 03/06/91 End Date 31/05/92 Total Contract Amount
Contractor WRC CONTRACTS PLC

CW0481 7/7/415 WR 7/3/121
Economic study of restrictions on the use of pesticides
Start Date 01/09/92 End Date 31/10/93 Total Contract Amount
Contractor WRC CONTRACTS PLC

CW0482 7/7/400 WR 7/3/118
Electrolytic cell for inactivation of viruses in water
Start Date 21/10/91 End Date 20/10/92 Total Contract Amount
Contractor UNI OF NEWCASTLE ON TYNE

CW0483 7/7/392 WR 7/3/101
Evaluation of effectiveness of filtration
Start Date 23/09/91 End Date 23/03/92 Total Contract Amount
Contractor IMPERIAL COLLEGE

CW0489 7/7/399 WR 7/3/120
Toxins from blue-green algae
Start Date 21/10/91 End Date 30/09/94 Total Contract Amount
Contractor WRC CONTRACTS PLC

CW0500 7/7/413 WR 7/3/122
Effects of storage period on analysis results for the
total and faecal coliform parameters
Start Date 01/10/92 End Date 30/06/94 Total Contract Amount
Contractor WRC CONTRACTS PLC

CW0502 7/7/414 WR/7/3/124
Feasibility study for a survey of backflow events
Start Date 01/09/92 End Date 31/03/93 Total Contract Amount
Contractor WRC CONTRACTS PLC

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504 7/7/416 WR/7/3/125
sibility study for an epidemiological survey
rt Date 24/06/92 End Date 31/12/92 Total Contract Amount
tractor LSHTM (UNIVERSITY OF LON

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509 7/7/424 WR 7/3/126
luation of presence/absence testing for coliform
anisms
rt Date 01/04/93 End Date 31/03/94 Total Contract Amount
tractor PUBLIC HEALTH LAB SERVICE

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586 1/9/005
availability of aluminium in drinking water
rt Date 15/01/94 End Date 31/03/94 Total Contract Amount
tractor AEA INDUSTRIAL TECHNOLOGY

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502 1/9/023 DWI 70/2/6
nking water consumption survey
rt Date 01/09/94 End Date 31/03/95 Total Contract Amount
tractor MIDLAND ENVIRONMENT LTD

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610 1/9/039 DWI 70/2/12
agenicity of fluoranthene - bone marrow assay
rt Date 01/11/94 End Date 01/02/95 Total Contract Amount
tractor HUNTINGDON RES CENTRE PLC

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611 1/9/038 DWI 70/2/12
agenicity of fluoranthene - liver UDS assay
rt Date 01/11/94 End Date 01/02/95 Total Contract Amount
tractor HUNTINGDON RES CENTRE PLC

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612 1/9/054 DWI 70/2/14
formance testing of an improved procedure for the
aration and concentration of oocysts of cryptosporidium
rt Date 23/01/95 End Date 31/10/95 Total Contract Amount
tractor Southern Science Ltd

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614 1/9/056 DWI 70/2/16
formance testing of an improved procedure for the
aration and concentration of oocysts of cryptosporidium
rt Date 23/01/95 End Date 31/10/95 Total Contract Amount
tractor YORKSHIRE ENV LAB SERVS

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615 1/9/0
netic methods trial - E
rt Date 01/01/95 End Date 31/12/95 Total Contract Amount
tractor

CW0623 1/9/048
Bromate analysis: supervision of performance tests
Start Date 30/11/94 End Date 17/02/95 Total Contract Amount
Contractor WRC CONTRACTS PLC

CW0624 1/9/049
Bromate analysis: Participation in performance testing
Start Date 30/11/94 End Date 01/01/95 Total Contract Amount
Contractor Thames Water Utilities Lt

CW0625 1/9/050
Bromate analysis: Participation in performance testing
Start Date 09/01/95 End Date 15/02/95 Total Contract Amount
Contractor SEVERN TRENT LABORATORIES

CW0627 1/9/0
Bromate analysis: Participation in performance testing
Start Date 21/11/94 End Date 31/12/94 Total Contract Amount
Contractor

CW0631 1/9/063 DWI 70/2/32
The Mutagenicity of Bromodichloromethane,
Chlorodibromomethane & Bromoform
Start Date 01/05/95 End Date 29/09/95 Total Contract Amount
Contractor HUNTINGDON RES CENTRE PLC

APPENDIX 3

WORK PLAN AND STAFF RESOURCING

WORK PLAN AND RESOURCING

Stage 1 - Assimilation of Information

- desk studies on policy files and papers, contract documents, reports (KAH/JM)
- analysis of ancillary/supporting information (KAH)
- interviews at DOE/other venues (KAH)
- interviews with contractors (KAH/JM)

KAH	-	17 man days
JM	-	12 man days
IB	-	2 man days
HF	-	2 man days
Total	-	**33 Man Days**

Stage 2 - Analysis and Assessment

- alignment with policy objectives
- science management (KAH)
- technical quality (KAH/IB/HF)
- dissemination, uptake, impact and value for money (KAH/JM)
- identification of gaps or omissions (HF)
- collaborative/consortium funding potential (KAH/JM)
- future direction (KAH/HF/JM)

KAH	-	16 man days
JM	-	7 man days
IB	-	10 man days
HF	-	5 man days
Agreed Consultees	-	5 man days
Total	-	**43 Man Days**

Stage 3 - Synthesis, Development of Recommendations and Provision of Report

- evaluation of present position (KAH)
- appraisal of future direction (ROAME statement) based on information retrieved and its analysis (KAH/HF)
- derivation of strategic overview (KAH)
- formulation of conclusions and recommendations (KAH)

KAH	-	15 man days
JM	-	7 man days
IB	-	3 man days
HF	-	5 man days
Total	-	**30 Man Days**

APPENDIX 4

LIST OF INTERVIEWEES

Dr Brian Craythorne	WRc plc, Henley Road, Medmenham Marlow, Bucks SL7 2HD
Professor Rodney Cartwright	Group Director, PHLS South Thames, Public Health Laboratory, St Luke's Hospital, Guildford GU1 3NT
Dr Nigel Lightfoot*	Regional Director, PHLS North East Region, Newcastle-upon-Tyne
Mike Williamson	Water Services Division 2, Water Directorate DOE
Dr Michael Harryman	Water Services Division 1, Water Directorate DOE
Mervyn Bramley	Head of R & D, Environment Agency, Rio House, Waterside Drive, Aztec West, Almondsbury Bristol BS12 4UD
Rex Agg	Technical Advisor, Foundation for Water Research, Allen House, The Listons, Liston Road, Marlow Bucks SL7 1FD
Ian Davidson	Chief Scientists Unit(Food), MAFF, Nobel House, Smith Square, London
Dr Michael Waring	Department of Health, Skipton House, 80 London Road, London SE1 6LW
Dr Judith Hilton	Department of Health, Skipton House, 80 London Road, London SE1 6LW
Dr Edwin Thairs	The Water Services Association of England and Wales, 1 Queen Anne's Gate, London SW1H 9BT
John West	Coordinator, UK Water Industry Research Ltd, 1 Queen Anne's Gate London SW1H 9BT
Tim Hooton*	Agriculture, Environment, and Fisheries Dept. Scottish Office, Pentland House, 47 Robb's Loan Edinburgh EH14 1 TW

Dr Rowena Tye	Office of Water Services, Centre City Tower, 7 Hill Street Birmingham B5 4UA
David Holt	Thames Water Utilities Ltd, Spencer House, Manor Farm Road, Reading
Tony Rachwal	Thames Water Utilities Ltd, Spencer House, Manor Farm Road, Reading
Paul West*	Public Health Manager, North West Water Ltd, Dawson House, Liverpool Road, Great Sankey, Warrington, Cheshire WA5 3LW
Bob Breach	Regulations Manager, Severn Trent Water Ltd, 2297 Coventry Road, Birmingham B26 3PU
Owen Hydes	Deputy Chief Inspector, Drinking Water Inspectorate, DOE, Romney House, 43 Marsham Street, London SW1P 3PY
Michael Rouse	Chief Inspector, Drinking Water Inspectorate, DOE, Romney House, 43 Marsham Street, London SW1P 3PY
Tony Lloyd	Superintending Inspector, Drinking Water Inspectorate, DOE, Romney House, 43 Marsham Street, London SW1P 3PY
Mark Smith	Inspector, Drinking Water Inspectorate, DOE, Romney House, 43 Marsham Street, London SW1P 3PY

* Telephone discussion

APPENDIX 5

INTERVIEW STRUCTURE

DRINKING WATER INSPECTORATE
WATER QUALITY AND HEALTH RESEARCH PROGRAMME EVALUATION

CANDIDATE ISSUES FOR DISCUSSION

Policy-Related

- Common policy links/objectives between DOE/DWI and your organisation. Intrinsic differences in such areas.

- Has this interface changed as a result of amendment to the DWI programme objectives in 1993.

- Are the current DWI programme objectives more or less appropriate to the interests of your organisation.

- DWI research outputs influence DOE policy. How do such policy changes impact on your organisation.

- What commonality of interest is there between research objectives in DWI, your organisation, European Commission funded research, and research undertaken in the USA.

- Are there any other emerging policy or strategic interface issues.

Science

- What common scientific/technical issues are there for DWI and your organisation. Examples of such issues might be nitrate, pesticides, microbial contamination, instrumentation for measurement.

- What scope might there be for collaboration in undertaking research (perhaps as distinct from agreeing commonality of objectives) either with your organisation or amongst others. What was the position in the past.

- What, if any, influence could contractors or their selection have in relation to collaborative or complementary research effort.

- How does your organisation view the inclusion of a modest level of fundamental research activity in the amended DWI research programme. What strategic issues might be priorities for funding?

Needs-Related Aspects

- How effective is the appraisal process in relation to the DWI research programme? Does your organisation have sufficient influence on strategy, specific items, ideas for investigation, prioritisation etc. If so, does this happen early or late in the appraisal process?

- What overall relationship exists with the water industry, specifically the larger companies in relation to formulation of the DWI programme?

- How effective is the dissemination of the outputs of the DWI programme. Are such outputs known to your organisation.

APPENDIX 6

PROFORMA FOR PROJECT EVALUATION

PROJECT ASSESSMENT

TITLE		
PROJECT NO	**CONTACT**	
RESEARCHER/CONTRACTOR		
	RATING	**COMMENTS**
QUALITY OF RESEARCH		
Policy links or statutory requirements		
Objectives		
- clear		
- attainable		
Objectives Realised		
- overall		
- management		
- monitoring/milestones		
- reports		
- facilities		
- quality of team		
USEFULNESS OF RESEARCH		
Results used by		
Aims fulfilled		
Innovative contribution		
Relevance to current concern		
User orientation		
Effectiveness of technology transfer		
Ease/affordability of implementation		
Other impacts/take-up		
Dissemination findings		
VALUE FOR MONEY		
Overall		
Other factors		
- maintaining timescale		
- use of prior supporting information		
- adherence to budget		
- added value achieved		
- other features		
OVERALL		

Notes: **+2 = Excellent/High** **-1 = Fair/Some Doubts or Flaws**
+1 = Good or Sound **-2 = Poor or Seriously Flawed**

APPENDIX 7

PROJECT ASSESSMENT SCORING VALUES

TITLE	Effect of Distribution on Organic Contaminants in Potable Water	Deterioration of Asbestos Cement Water Mains	Identification of Mutagens in Potable Water
REPORT NO **PROJECT NO**	**113, 32, 25** **WR 7/3/17**	**122, 131** **WR 7/3/30**	**20** **WR 7/3/31**
DURATION (yrs) & START DATE (yr) **CONTRACTOR** **TENDER (Single/Competitive) (S/C)**	**6.2 1983** **WRc** **S**	**4 1984** **WRc** **S**	**5.9 1984** **WRc** **S**
QUALITY OF RESEARCH	**+1**	**+1**	**+2**
Policy link or statutory requirement	+2	+2	+2
Objectives			
- Clear	+1	+2	+2
- Attainable	+2	+1	+1
Objectives Realised	+1	+1	+2
Execution of Project			
- Overall	+1	+1	+2
- Management	+1	+1	+2
- Monitoring/milestones	+1	+2	+1
- Reports	+1	+1	+2
- Facilities	+2	+1	+1
- Quality of team	+1	+1	+2
- Extent of scientific advance		+1	
USEFULNESS OF RESEARCH	**+2**	**+2**	**+2**
Results used by	CCM, Water Cos	Water Cos, DOE	
Aims fulfilled	+2	+1	+1
Innovative contribution	+1	+1	+1
Relevance to current concern	+2	+2	+2
User orientation	+1	+2	+1
Effectiveness of technology transfer	+2	+2	-1
Ease/affordability of implementation	+1	+1	-1
Other impacts/take-up			
Dissemination of findings	+1	-1	+2
VALUE FOR MONEY	**+1**	**+2**	**+1**
Factors involved:			
- Maintaining timescale	+1	+1	+1
- Use of prior/supporting information	+2	+2	
- Adherence to budget	+1	+2	+2
- Added value achieved	+1	+2	
- Other features			
NOTES			

TITLE	Effects of Disinfection on Organic Substances in Water	Electrolytic Generation of Chlorine for Disinfection of Private Supplies	Deterioration of Water Quality in Distribution Systems a) WQ meter b) Linings
REPORT NO PROJECT NO	See Below WR 7/3/34	203 WR 7/3/35	255 WR 7/3/32
DURATION (yrs) & START DATE (yr) CONTRACTOR TENDER (Single/Competitive) (S/C)	10.5 1984 WRc S	5.2 1984 Univ Newcastle-on-Tyne S	6.75 1984 WRc S (a) (b)
QUALITY OF RESEARCH	**+2**	**-1**	**+1 +1**
Policy link or statutory requirement	+2	+2	+1 +2
Objectives			
- Clear	+1	+2	+1 +2
- Attainable	+1	-1	-1 +1
Objectives Realised	+2	-2	-1 +2
Execution of Project			
- Overall	+1	-1	+1 +1
- Management	+2	-1	+1 +1
- Monitoring/milestones	+1	-1	+1 +1
- Reports	+2	-1	+1
- Facilities	+2	+1	+1 +2
- Quality of team	+2	-1	+1 +1
- Extent of scientific advance	+1		-1
USEFULNESS OF RESEARCH	**+1**	**-2**	**-1 +2**
Results used by	Water Cos, DOE, EC		Water cos/ Manufact'rs
Aims fulfilled	+1	-1	+1
Innovative contribution	+2	-2	+1 +1
Relevance to current concern	+2	-2	-1 +2
User orientation	+2	-2	-1 +1
Effectiveness of technology transfer	+1	-1	
Ease/affordability of implementation	+1	-2	-1 -1
Other impacts/take-up	+1		
Dissemination of findings	+1	-2	-1 +1
VALUE FOR MONEY	**+2**	**-1**	**+1 +1**
Factors involved:			
- Maintaining timescale	+1	-2	-1 -1
- Use of prior/supporting information	+2	+1	+1 +1
- Adherence to budget	+2	-1	+1 +1
- Added value achieved	+1		-1 +1
- Other features			
NOTES	736-738, 296-299, 22, 99, 136-137, 316 (651, 330)		

TITLE	Bacteriological Sampling and Analysis	Use of Cytotoxicity Assays for Assessing Toxicity	Volatile and Non-Volatile Organic Compounds
REPORT NO **PROJECT NO**	**27, 331** **WR 7/3/46**	**31** **WR 7/3/47**	**2, (447, 448)** **WR 7/3/65**
DURATION (yrs) & START DATE (yr) **CONTRACTOR** **TENDER (Single/Competitive) (S/C)**	**2 1985** **WRc** **S**	**3.1 1985** **WRc** **S**	**0.66 1986** **CES Ltd** **S**
QUALITY OF RESEARCH	**+2**	**+1**	**+1**
Policy link or statutory requirement	+2	+1	+1
Objectives			
- Clear	+2	+2	+1*
- Attainable	+1	+1	+1
Objectives Realised		+1	+1
Execution of Project			
- Overall	+2	+1	+2
- Management	+2	+1	+2
- Monitoring/milestones	+2	-1	+2
- Reports	+2	+2	+1*
- Facilities	+2	+2	+1
- Quality of team	+2	+1	+1
- Extent of scientific advance	+2	+1	-
USEFULNESS OF RESEARCH	**+2**	**+1**	**+1**
Results used by	DOE, Water Co's	CCM, Water Co's	DOE, Water Co's
Aims fulfilled	+2	+1	+1
Innovative contribution	+1	+1	-1
Relevance to current concern	+2	+1	+2
User orientation	+2		-1
Effectiveness of technology transfer	+2	-1	+1
Ease/affordability of implementation	+1	+1	
Other impacts/take-up	+1		
Dissemination of findings	+1		
VALUE FOR MONEY	**+2**	**+1**	**+2**
Factors involved:			
- Maintaining timescale	+2	+1	+2
- Use of prior/supporting information	+2	+2	+2
- Adherence to budget	+1	+2	+2
- Added value achieved	+2	+1	+1
- Other features			
NOTES			No File * Verbose

TITLE	Plans as Monitors for Heavy Metals in Freshwater	Evaluation of Nitrate Monitor and Controller	Effect of Nitrate Removal on WQ in Supply
REPORT NO **PROJECT NO**	**706** **WR 7/3/68**	**160** **WR 7/3/70**	**1** **WR 7/3/71**
DURATION (yrs) & START DATE (yr) **CONTRACTOR** **TENDER (Single/Competitive) (S/C)**	**0.66 1986** **Univ of Durham** **S**	**1.8 1987** **Aztec Environment Ltd** **S**	**1 1986** **CES Ltd** **S**
QUALITY OF RESEARCH	**-1**	**+1**	**-1**
Policy link or statutory requirement	-1	+2	+2
Objectives			
- Clear	+1	+2	+2
- Attainable	+1	+2	+2
Objectives Realised	-1	+1	+1
Execution of Project			
- Overall	-1	+1	+1
- Management	-1	+1	
- Monitoring/milestones	-1	+1	
- Reports	-2	-1	+1
- Facilities	+1	+1	
- Quality of team	+1	+1	
- Extent of scientific advance		+1	-2
USEFULNESS OF RESEARCH		**+2**	
Results used by			
Aims fulfilled		+2	
Innovative contribution		+1	
Relevance to current concern		+2	
User orientation		+2	
Effectiveness of technology transfer		+2	
Ease/affordability of implementation		+1	
Other impacts/take-up			
Dissemination of findings		-1	
VALUE FOR MONEY		**+1**	
Factors involved:			
- Maintaining timescale		+1	
- Use of prior/supporting information		+2	
- Adherence to budget		+1	
- Added value achieved		+1*	
- Other features			
NOTES	No File	* Licensing to Manufacturer	No File

TITLE	Characterisation of Two Unidentified Contaminants	Clostridia as Indicators of Water Treatment works Efficiency	Assessment of Monitoring Requirements for Drinking Water
REPORT NO PROJECT NO	175 WR 7/3/73	None DWI 70/2/7	In File WR 7/3/131
DURATION (yrs) & START DATE (yr) CONTRACTOR TENDER (Single/Competitive) (S/C)	0.5 1987 Cantock Enterprises Ltd S	0.6 1994 UK WIR Ltd C	0.6 1993 WRc C
QUALITY OF RESEARCH	-1		+2
Policy link or statutory requirement Objectives - Clear - Attainable Objectives Realised Execution of Project - Overall - Management - Monitoring/milestones - Reports - Facilities - Quality of team - Extent of scientific advance	+1 -2 +1 +1 -1 +1 +1 -1 -1		+2 +2 +2 +2 +2 +2 +2 +1 +2 +1
USEFULNESS OF RESEARCH			+2
Results used by Aims fulfilled Innovative contribution Relevance to current concern User orientation Effectiveness of technology transfer Ease/affordability of implementation Other impacts/take-up Dissemination of findings			Water Co's, DOE +2 +1 +2 +2 +2 +2 +2
VALUE FOR MONEY			+2
Factors involved: - Maintaining timescale - Use of prior/supporting information - Adherence to budget - Added value achieved - Other features			 +2 +2 +2 +2
NOTES	No File	UKWIR Report	

TITLE	Review of Microbiological Risk Assessment and Drinking Water Supplies	Improved Materials Testing Procedures	Identification of Unknown Organic Substances in Water Sources and Supplies
REPORT NO PROJECT NO	653 DWI 70/2/5	See Below WR 7/3/113	652? DWI 43/02/33
DURATION (yrs) & START DATE (yr) CONTRACTOR TENDER (Single/Competitive) (S/C)	0.66 1994 WRc C	4.6 1990 WRc S	0.45 1994 WRc C
QUALITY OF RESEARCH	**+2**	**+2**	**+1**
Policy link or statutory requirement	+2	+2	+1
Objectives			
- Clear	+2	+2	-2
- Attainable	+2	+1	+1
Objectives Realised	+2	+1	+1
Execution of Project			
- Overall	+2	+2	+1
- Management	+1	+2	+1
- Monitoring/milestones	+2	+2	+1
- Reports	+2	+2	-1
- Facilities	+2		+1
- Quality of team	+2	+1	
- Extent of scientific advance		+1	-2
USEFULNESS OF RESEARCH	**+2**	**+1**	
Results used by	Water Co's, DOE	DOE, CEN	
Aims fulfilled	+2	+1	
Innovative contribution	+1	+1	
Relevance to current concern	+2	+2	
User orientation	+1	+1	
Effectiveness of technology transfer		+1	
Ease/affordability of implementation		+1	
Other impacts/take-up			
Dissemination of findings	-1		
VALUE FOR MONEY	**+2**	**+1**	
Factors involved:			
- Maintaining timescale	+1	+1	
- Use of prior/supporting information	+2		
- Adherence to budget	+2	+1	
- Added value achieved			
- Other features			
NOTES		249-253, 293, 388, 722, 715	No File

TITLE	**A Desk Study into the Reliability of Mechanical Backflow Prevention Devices**	**Performance Testing of the Method of Analysis for Microcystim**	**Survey of Concentrations of Algal Toxins in Water Supplies**
REPORT NO **PROJECT NO**	**In File?** **DWI 7/2/024**	**In File** **WR 7/3/130**	**719, 654?** **DWI 70/2/4**
DURATION (yrs) & START DATE (yr) **CONTRACTOR** **TENDER (Single/Competitive) (S/C)**	**0.4 1994** **BSRIA** **C**	**0.5 1993** **WRc** **S**	**0.33 1994** **WRc** **C**
QUALITY OF RESEARCH	**+2**	**+2**	**+1**
Policy link or statutory requirement	+2	+1	+1
Objectives			
- Clear	+2	+1	+2
- Attainable	+2	+1	+1
Objectives Realised		+1	+1
Execution of Project			
- Overall	+2	+1	+1
- Management	+2	+1	+1
- Monitoring/milestones	+1	+1	+1
- Reports	+1	-1	-2
- Facilities		+1	+1
- Quality of team	+1	+1	+1
- Extent of scientific advance	-1		-1
USEFULNESS OF RESEARCH		**+2**	
Results used by		SCA	
Aims fulfilled		+1	
Innovative contribution		-1	
Relevance to current concern		+1	
User orientation		+1	
Effectiveness of technology transfer		+1	
Ease/affordability of implementation		+1	
Other impacts/take-up			
Dissemination of findings		-1	
VALUE FOR MONEY		**+1**	
Factors involved:			
- Maintaining timescale		+1	
- Use of prior/supporting information		+1	
- Adherence to budget		+1	
- Added value achieved			
- Other features			
NOTES	No File		No File

TITLE	Microbial Growth on Materials in Contact Water	Sources of Phenolic/ Chlorophenolic Tastes in Drinking Water	Pesticides in Drinking Water Sources and Supplies
REPORT NO **PROJECT NO**	**279, 282, 294, 324** **WR 7/3/78**	**30, 115, 277, 278** **WR 7/3/80**	**301** **WR 7/3/76**
DURATION (yrs) & START DATE (yr) **CONTRACTOR** **TENDER (Single/Competitive) (S/C)**	4.9 1987 WRc S	2 1987 WRc S	5.85 1987 WRc S
QUALITY OF RESEARCH	**+2**	**+1**	**+2**
Policy link or statutory requirement	+2	+1	+2
Objectives			
- Clear	+2	+2	+2
- Attainable	+1	+1	+1
Objectives Realised	+2	+1	+1
Execution of Project			
- Overall	+2	+1	+1
- Management	+1	+1	+1
- Monitoring/milestones		-1	+2
- Reports	+2	-1	+2
- Facilities	+2	+1	+1
- Quality of team	+1	+1	+1
- Extent of scientific advance	+1	+1	+1
USEFULNESS OF RESEARCH	**+1**	**-1**	**+1**
Results used by	DOE, CEC, Water Co's		Water Co's, DOE
Aims fulfilled	+2	+1	+1
Innovative contribution	+1	-1	+1
Relevance to current concern	+2	+1	+2
User orientation		-1	+1
Effectiveness of technology transfer	+1	-1	+1
Ease/affordability of implementation	+1	-1	
Other impacts/take-up			
Dissemination of findings		+1	+1
VALUE FOR MONEY	**+1**	**-1**	**+1**
Factors involved:			
- Maintaining timescale	+1	-1	+1
- Use of prior/supporting information	+2	+1	+1
- Adherence to budget		-1	-1
- Added value achieved			
- Other features			
NOTES	No File		

TITLE	Paticulate Lead in Water Supplies	Surrogate Viral Indicators	Detection of Toxin Producing Strains of E. coli.
REPORT NO **PROJECT NO**	79 WR 7/3/77	287 WR 7/3/81	443, 674 DWI 70/2/9
DURATION (yrs) & START DATE (yr) **CONTRACTOR** **TENDER (Single/Competitive) (S/C)**	4.6 1987 WRc S	3 1987 WRc S	0.6 1994 Strathcylde Water C
QUALITY OF RESEARCH	**-1**	**-1**	**+1**
Policy link or statutory requirement	+2	+1	+1
Objectives			
- Clear	+1	-1	+1
- Attainable	-1	-2	+1
Objectives Realised	-1	-1	
Execution of Project			
- Overall	-1	+1	+1
- Management	-1	+1	+1
- Monitoring/milestones	-1	+1	+1
- Reports	-1	+1	-1
- Facilities	+1	+1	+1
- Quality of team	-1		+1
- Extent of scientific advance	-2	-1	-1
USEFULNESS OF RESEARCH	**-1**	**-1**	**+1**
Results used by	Water Co's,DOE, L.Auth		
Aims fulfilled	-1	-1	+1
Innovative contribution	-1	-1	-1
Relevance to current concern	+2	+1	+1
User orientation	-2	+1	+1
Effectiveness of technology transfer	-1	-1	
Ease/affordability of implementation	-1	-2	
Other impacts/take-up	-1		
Dissemination of findings	+1	-1	-1
VALUE FOR MONEY	**-1**	**-1**	**+1**
Factors involved:			
- Maintaining timescale	+1	+1	+1
- Use of prior/supporting information	+1	+1	+1
- Adherence to budget	+1	+1	+1
- Added value achieved	-1	-1	
- Other features			
NOTES			

TITLE	Mutagenic Activity of Concentrated Water Samples in vira	Evaluation of Efficiency of Alternative Disinfectants	PAH in Drinking Water - Investigation of leaching
REPORT NO PROJECT NO	112? WR 7/3/74	274, 300 WR 7/3/82	327, 843 WR 7/3/128
DURATION (yrs) & START DATE (yr) CONTRACTOR TENDER (Single/Competitive) (S/C)	2.4 1987 WRc S	5.1 1987 WRc S	1 1992 WRc S
QUALITY OF RESEARCH	**+1**	**+2**	**+2**
Policy link or statutory requirement	+2	+1	+1
Objectives			
- Clear	+2	+2	+2
- Attainable	+1	+1	+1
Objectives Realised	+1		
Execution of Project			
- Overall	+1	+2	_1
- Management	+1	+1	+2
- Monitoring/milestones	+1		+2
- Reports	+1	+1	+2
- Facilities	+2	+1	+2
- Quality of team	+1	+1	+1
- Extent of scientific advance	+1	+1	+1
USEFULNESS OF RESEARCH	**+1**	**+1**	**+2**
Results used by	DOE, Water Co's		Water Co's
Aims fulfilled	+1	+1	+1
Innovative contribution	_1	+1	+1
Relevance to current concern	_2	+1	+2
User orientation	_1	+1	+2
Effectiveness of technology transfer	-1		
Ease/affordability of implementation			+1
Other impacts/take-up			
Dissemination of findings	+1	-1	-1
VALUE FOR MONEY	**+1**	**-1**	**+1**
Factors involved:			
- Maintaining timescale	+2	-1	+2
- Use of prior/supporting information	+1	+1	+2
- Adherence to budget	+2	-1	+1
- Added value achieved	+1		
- Other features			
NOTES			

TITLE	Leaching of lead from Blue UPVC Pipe	Evaluation of HPLC Columns for Ionic Chromatography	To Evaluate Capability of Existing SCA Methods for Determining Dichloroprop...
REPORT NO **PROJECT NO**	**207** **WR 7/3/134**	**670** **WR 7/3/83**	**189** **WR 7/3/90**
DURATION (yrs) & START DATE (yr) **CONTRACTOR** **TENDER (Single/Competitive) (S/C)**	**0.5 1993** **CES Ltd** **C**	**0.33 1983** **Cantock Enterprises Ld** **S**	**0.5 1987** **Severn Trent Water** **S**
QUALITY OF RESEARCH	**-2**	**+1**	**+1**
Policy link or statutory requirement	+2	+1	+2
Objectives			
- Clear	+2	+2	+2
- Attainable	+1	+2	+2
Objectives Realised	-2	+1	+1
Execution of Project			
- Overall	-1	+1	+1
- Management	+2	+1	+1
- Monitoring/milestones	+1	+1	+1
- Reports	+2	-1	-1
- Facilities	+1	+1	+1
- Quality of team	+1	+2?*	
- Extent of scientific advance	-2	-1	-1
USEFULNESS OF RESEARCH	**-2**	**+1**	
Results used by	Not usable	SCA, Water Co's	
Aims fulfilled	-2	+1	
Innovative contribution	-1		
Relevance to current concern	-1	+1	
User orientation	-1	+1	
Effectiveness of technology transfer	-1		
Ease/affordability of implementation		+1	
Other impacts/take-up	-1		
Dissemination of findings	-1	+1	
VALUE FOR MONEY	**-2**	**+1**	
Factors involved:			
- Maintaining timescale	+2	+1	
- Use of prior/supporting information	-2	+1	
- Adherence to budget	+2	+1	
- Added value achieved	-2		
- Other features			
NOTES		* Said to be unique in UK	No File

TITLE	Evaluation of Rapid Confirmation Tests for Total Coliforms and E.coli.	Evaluation of High Pressure Liquid Chromatography Ion Chromatography of Trace Metals in Water	Biological Denitrificaton Control of Adverse Side Effects
REPORT NO **PROJECT NO**	**153, 673** **WR 7/3/89**	**176** **WR 7/3/83**	**280** **WR 7/3/94**
DURATION (yrs) & START DATE (yr) **CONTRACTOR** **TENDER (Single/Competitive) (S/C)**	**0.5 1987** **Strathclyde Reg Cncl** **S**	**0.45 1987** **UKAEA** **S**	**2.66 1988** **WRc** **S**
QUALITY OF RESEARCH	**+1**	**+2**	**+1**
Policy link or statutory requirement	+1	+1	+1
Objectives			
- Clear	+2	+2	+2
- Attainable	+2	+2	+2
Objectives Realised	+2	+2	+1
Execution of Project			
- Overall	+1	+2	+1
- Management	+1	+1	+1
- Monitoring/milestones	+1	+1	+1
- Reports	+1	+2	-1
- Facilities	+2	+1	+1
- Quality of team	+1	+2	+1
- Extent of scientific advance	-1	+1	+1
USEFULNESS OF RESEARCH		**+2**	
Results used by		SCA, Water Co's	
Aims fulfilled		+2	
Innovative contribution		+1	
Relevance to current concern		+1	
User orientation		+2	
Effectiveness of technology transfer		+1	
Ease/affordability of implementation		+1	
Other impacts/take-up			
Dissemination of findings			
VALUE FOR MONEY		**+1**	
Factors involved:			
- Maintaining timescale		+2	
- Use of prior/supporting information		+2	
- Adherence to budget		+2	
- Added value achieved		+1	
- Other features			
NOTES	No File		No File

TITLE	Evaluation of Suitable Backflow Prevention Devices	Development of Gene Probe Techniques for Coliform Organisms	Computer Prediction of Effects of Water Quality Characteristics of Denitrification ...
REPORT NO **PROJECT NO**	259-263 WR 7/3/95	135 WR 7/3/96	142 WR 7/3/98
DURATION (yrs) & START DATE (yr) **CONTRACTOR** **TENDER (Single/Competitive) (S/C)**	4.66 1988 WRc S	4.85 1988 WRc S	0.33 1988 Cranfield Inst Tech S
QUALITY OF RESEARCH	+2	+1	+1
Policy link or statutory requirement	+2	+1	+2
Objectives			
- Clear	+2	+1	+1
- Attainable	+2	-1	+1
Objectives Realised	+2	+1	+1*
Execution of Project			
- Overall	+1	+2	+1
- Management	+1	+1	-1
- Monitoring/milestones	+2	+1	-1
- Reports	+2	+1	-2
- Facilities	+1	+1	+1
- Quality of team		-1	
- Extent of scientific advance		-1	-1
USEFULNESS OF RESEARCH			
Results used by Aims fulfilled Innovative contribution Relevance to current concern User orientation Effectiveness of technology transfer Ease/affordability of implementation Other impacts/take-up Dissemination of findings			
VALUE FOR MONEY			
Factors involved: - Maintaining timescale - Use of prior/supporting information - Adherence to budget - Added value achieved - Other features			
NOTES	No File	No File	No File * Modified

TITLE	Bacterial Colonisation of Treated Water Systems	Evaluation of SCA Method for Determination of Difenzoqua....	Evaluation of SCA Method for Determination of Evlan....
REPORT NO **PROJECT NO**	213 WR 7/3/099	154 WR 7/3/101	161 WR 7/3/104
DURATION (yrs) & START DATE (yr) **CONTRACTOR** **TENDER (Single/Competitive) (S/C)**	5.25 1989 CAMR S	0.25 1989 Southern Water C	1.5 1989 NW Water Auth S
QUALITY OF RESEARCH	+1	+1	+1
Policy link or statutory requirement	+2	+2	+1
Objectives			
- Clear	+2	+2	+1
- Attainable	+1	+2	+1
Objectives Realised	+2	+1	+2
Execution of Project			
- Overall	+1	+1	+1
- Management	+1	+1	+1
- Monitoring/milestones	+1	+1	-1
- Reports	+2	+1	-2
- Facilities	+1	+1	+1
- Quality of team	+1		+1
- Extent of scientific advance	+1	-1	-1
USEFULNESS OF RESEARCH		+1	
Results used by		SCA	
Aims fulfilled		+1	
Innovative contribution		+1	
Relevance to current concern		+1	
User orientation		+2	
Effectiveness of technology transfer		+2	
Ease/affordability of implementation		+1	
Other impacts/take-up			
Dissemination of findings		+1	
VALUE FOR MONEY		+2	
Factors involved:			
- Maintaining timescale		+2	
- Use of prior/supporting information		+2	
- Adherence to budget		+2	
- Added value achieved			
- Other features			
NOTES	No File		No File

TITLE	Loose Deposits in Water Mains	Cryptosporidia in Drinking Water	Testing Protocol and Manual of Guidance on Application of Point of Use Treatment....
REPORT NO **PROJECT NO**	**295** **WR 7/3/107**	**265-269, 336-338, 341, 359, 683?** **WR 7/3/112**	**258, 302-307, 322, 344, 480** **WR 7/3/115**
DURATION (yrs) & START DATE (yr) **CONTRACTOR** **TENDER (Single/Competitive) (S/C)**	**2.95 1989** **WRc** **S**	**4.25 1990** **WRc** **S**	**1.6 1991** **WRc** **S**
QUALITY OF RESEARCH	**+1**	**+2**	**+1**
Policy link or statutory requirement	+1	+2	+2
Objectives			
- Clear	+2	+2	+1
- Attainable	+1	+1	+2
Objectives Realised	+1	+1	+2
Execution of Project			
- Overall	+2	+1	+1
- Management	+1	+2	-1
- Monitoring/milestones		+2	-1
- Reports	+1	+2	+1
- Facilities	+2	+1	
- Quality of team	+1	+2	+1
- Extent of scientific advance	+1	+2	
USEFULNESS OF RESEARCH	**+1**	**+1**	**+2**
Results used by	DOE	DOE, W Industry	Loc Auth, EHOs, Water Co's
Aims fulfilled	+1	+1	+1
Innovative contribution	+1	+1	+1
Relevance to current concern	+1	+2	+2
User orientation	+1	-1	+2
Effectiveness of technology transfer		-1	+2
Ease/affordability of implementation	-1	+1	+2
Other impacts/take-up			
Dissemination of findings		+1	+2
VALUE FOR MONEY	**+1**	**+1**	**+1**
Factors involved:			
- Maintaining timescale		+2	-1
- Use of prior/supporting information	+1	+1	+2
- Adherence to budget		-1	+1
- Added value achieved	+1	-1	+1
- Other features			-1*
NOTES	No File Final Report Only		* Copyright Problems

TITLE	Economics of Lead Pipe Replacement	Economic Study of Restrictions on the Use of Pesticides	Electrolytic Cell for Macturation of Viruses in Water
REPORT NO PROJECT NO	76, 290 WR 7/3/116	380, 718 WR 7/3/121	In File WR 7/3/118
DURATION (yrs) & START DATE (yr) CONTRACTOR TENDER (Single/Competitive) (S/C)	1 1991 WRc S	1.15 1992 WRc C	1.1 1991 Univ Newcastle-on-Tyne S
QUALITY OF RESEARCH	+2	-1	-2
Policy link or statutory requirement	+2	+2	-1
Objectives			
- Clear	+2	+2	-1
- Attainable	+2	-1	-1
Objectives Realised	+2	-1	-1
Execution of Project			
- Overall	+2	-1	-1
- Management	+2	-1	-2
- Monitoring/milestones	+2	-1	-2
- Reports	+2	+1	-1
- Facilities	+1	-1	+1
- Quality of team	+1	-1	?
- Extent of scientific advance	+1	-1	-1
USEFULNESS OF RESEARCH	+2	-1	-2
Results used by	DOE, Water Industry		
Aims fulfilled	+2	-1	-1
Innovative contribution	+1	-1	-1
Relevance to current concern	+2	+1	-1
User orientation	+2	-1	-2
Effectiveness of technology transfer	+2		
Ease/affordability of implementation			
Other impacts/take-up			-1
Dissemination of findings		-1	-1
VALUE FOR MONEY	+2	+1	-2
Factors involved:			
- Maintaining timescale	+2	-1	-1
- Use of prior/supporting information	+2	+1	-1
- Adherence to budget	+2	-1	-1
- Added value achieved	+2		-1
- Other features			
NOTES			

TITLE	Evaluation of Effectiveness of Filtration	Toxins from Blue-Green Algae	Effects of Storage Period on Analysis Results for the Total and Faecal Coliform Parameters
REPORT NO	**200**	**347-354, 357-358, 643**	**314**
PROJECT NO	**DWI 44/1/28**	**WR 7/3/120**	**WR 7/3/122**
DURATION (yrs) & START DATE (yr)	**0.5 1991**	**2.95 1991**	**1.8 1992**
CONTRACTOR	**Imperial College Sci Tech**	**WRc**	**WRc**
TENDER (Single/Competitive) (S/C)	**S**	**S**	**S**
QUALITY OF RESEARCH	**+2**	**+2**	**+2**
Policy link or statutory requirement	+1	+1	+2
Objectives			
- Clear	+1	+1	+2
- Attainable	+2	+1	+1
Objectives Realised	+1	+1	+1
Execution of Project			
- Overall	+1	+1	+1
- Management	+1	+2	+1
- Monitoring/milestones	+1	+2	-1
- Reports	+2	+1	-1
- Facilities	+2	+2	
- Quality of team	+2	+2	
- Extent of scientific advance		+1	-1
USEFULNESS OF RESEARCH	**-1**		**+1**
Results used by			
Aims fulfilled	+2		-1
Innovative contribution	-1		+1
Relevance to current concern	-2		+1
User orientation	-2		+1
Effectiveness of technology transfer	-2		
Ease/affordability of implementation			+1
Other impacts/take-up			
Dissemination of findings			-1
VALUE FOR MONEY	**+1**		**-1**
Factors involved:			
- Maintaining timescale	+1		-1
- Use of prior/supporting information	+2		+1
- Adherence to budget	+2		+1
- Added value achieved	-1		
- Other features			
NOTES		Incomplete files. Co-ordination of reports difficult in absence of certain contract files	Limited file information

TITLE	Feasibility Study for a Survey of Backflow Events	Feasibility Study for an Epidemiological Survey	Evaluation of Presence/Absence Testing for Coliform Organisms
REPORT NO **PROJECT NO**	**138, 445** **WR 7/3/124**	**Published** **WR 7/3/125**	**206, 397** **WR 7/3/126**
DURATION (yrs) & START DATE (yr) **CONTRACTOR** **TENDER (Single/Competitive) (S/C)**	**0.6 1992** **WRc** **C**	**0.45 19992** **LSHTM** **S**	**1 1993** **PHLS** **C**
QUALITY OF RESEARCH	**+1**	**+2**	**+1**
Policy link or statutory requirement	+2	+2	+1
Objectives			
- Clear	+2	+2	-1
- Attainable	+1	+2	+1
Objectives Realised	+1	+2	+1
Execution of Project			
- Overall	+1	+2	-1
- Management	-1	+2	-1
- Monitoring/milestones	+1	+1	-1
- Reports	-2	+1	+1
- Facilities	+1	+2	+2
- Quality of team	-1	+2	+2
- Extent of scientific advance	+1		+1
USEFULNESS OF RESEARCH	**+2**	**+1**	**+1**
Results used by	Water Co's	DOE, DWI, Water Industry	
Aims fulfilled	+2	+2	+1
Innovative contribution	+1	-1	+1
Relevance to current concern	+2	+2	+1
User orientation	+2	+2	+1
Effectiveness of technology transfer	+2		-1
Ease/affordability of implementation	+1		
Other impacts/take-up			
Dissemination of findings	+2	+1	+1
VALUE FOR MONEY	**+1**	**+2**	**+1**
Factors involved:			
- Maintaining timescale	+1	+1	-1
- Use of prior/supporting information	+2	+2	+1
- Adherence to budget	+1	+1	+1
- Added value achieved	+1		
- Other features			
NOTES			

TITLE	Bioavailability of Aluminium in Drinking Water	Drinking Water Consumption Survey	Performance Testing of an Improved Procedure for the Separation and Concentration of O Ocyts ...
REPORT NO PROJECT NO	689 WR 7/3/133	Draft Only DWI 70/2/6	Data in File DWI 70/2/14
DURATION (yrs) & START DATE (yr) CONTRACTOR TENDER (Single/Competitive) (S/C)	0.2 1994 AEA Technology C	0.55 1994 Midland Envir Ltd C	0.75 1995 Southern Science Ltd C
QUALITY OF RESEARCH	+2	+1	+1
Policy link or statutory requirement	+1	+1	+2
Objectives			
- Clear	+2	+2	+1
- Attainable	+2	+2	+1
Objectives Realised	1	+1	
Execution of Project			
- Overall	+2	+1	+1
- Management	+2	+1	
- Monitoring/milestones	+1	+1	+1
- Reports	+2	-1	
- Facilities	+2	+1	+1
- Quality of team	+2	+1	+1
- Extent of scientific advance	+1	-1	
USEFULNESS OF RESEARCH		+1	+1
Results used by		Water Industry	
Aims fulfilled		+1	+2
Innovative contribution		-1	+1
Relevance to current concern		+2	+2
User orientation		+1	+2
Effectiveness of technology transfer			
Ease/affordability of implementation			+1
Other impacts/take-up			
Dissemination of findings		-1	-2
VALUE FOR MONEY		+1	+1
Factors involved:			
- Maintaining timescale		-1	+1
- Use of prior/supporting information		+2	+1
- Adherence to budget		+1	+1
- Added value achieved			-1
- Other features			
NOTES	No File	Collaborative with Water Industry (UKWIR) Draft Report Only (now published)	Data only - no report

TITLE	Performance Testing of an Improved Procedure for the Separation and Concentration of O Ocyts...	Bromate Analysis: Supervision of Performance Tests	The Mutagenicity of Bromodichloro Methane ...
REPORT NO **PROJECT NO**	**Data in File** **DWI 70/2/16**	**721** **DWI 70/2/029**	**710-714** **DWI 70/2/33**
DURATION (yrs) & START DATE (yr) **CONTRACTOR** **TENDER (Single/Competitive) (S/C)**	**0.75 1995** **Yorks Env Lab Serv** **C**	**0.2 1994** **WRc** **C**	**0.45 1995** **Huntingdon Res Centre** **C**
QUALITY OF RESEARCH	**+1**	**+1**	**+1**
Policy link or statutory requirement	+2	+1	-1
Objectives			
- Clear	+1	+1	-2
- Attainable	+1	+1	+1
Objectives Realised		+2	+1
Execution of Project			
- Overall	+1	+2	+1
- Management		+2	
- Monitoring/milestones	+1	+1	
- Reports		+1	-1
- Facilities	+1	+1	+1
- Quality of team	+1		+1
- Extent of scientific advance			
USEFULNESS OF RESEARCH	**+1**	**+1**	**-1**
Results used by			
Aims fulfilled	+2	+1	+1
Innovative contribution	+1	-1	-1
Relevance to current concern	+2	+1	-1
User orientation	+2	+2	-1
Effectiveness of technology transfer		+1	
Ease/affordability of implementation	+1	+1	
Other impacts/take-up			
Dissemination of findings	-2	-1	-1
VALUE FOR MONEY	**+1**	**+2**	
Factors involved:			
- Maintaining timescale	+1	+2	
- Use of prior/supporting information	+1	+1	
- Adherence to budget	+1	+1	
- Added value achieved	-1	+1	
- Other features			
NOTES	Data only - no report		

TITLE	**The Evaluation of a Screening Test for Detecting Microcystim Algal Toxins**
REPORT NO **PROJECT NO**	**In File** **DWI 70/2/27**
DURATION (yrs) & START DATE (yr) **CONTRACTOR** **TENDER (Single/Competitive) (S/C)**	**0.2 1995** **MRC, Univ Dundee** **C**
QUALITY OF RESEARCH	**-1**
Policy link or statutory requirement Objectives - Clear - Attainable Objectives Realised Execution of Project - Overall - Management - Monitoring/milestones - Reports - Facilities - Quality of team - Extent of scientific advance	-1 -2 +1 +1 +1 -1 +1 +1
USEFULNESS OF RESEARCH	**-1**
Results used by Aims fulfilled Innovative contribution Relevance to current concern User orientation Effectiveness of technology transfer Ease/affordability of implementation Other impacts/take-up Dissemination of findings	 +1 -1 -1 -1 -1
VALUE FOR MONEY	
Factors involved: - Maintaining timescale - Use of prior/supporting information - Adherence to budget - Added value achieved - Other features	
NOTES	

APPENDIX 8

ROAME STATEMENT

DRINKING WATER INSPECTORATE
EVALUATION OF WATER QUALITY AND HEALTH
RESEARCH PROGRAMME

ROAME STATEMENT

1 Rationale

1.1 The provision of safe and wholesome water to drink requires legal enforcement and the definition of a range of standards and regulations. The necessary provisions are contained in The Water Industry Act 1991 into which the provisions of the Water Act 1989 are largely subsumed. The definition of such standards and regulations derives from government policy relating to the provision of wholesome drinking water. The process requires publicly-funded research endeavour to provide credible independent information and advice. This is the **purpose** of the research sub-programme.

1.2 In England and Wales this responsibility rests with the Secretary of State for the Environment and the Secretary of State for Wales. The Department of the Environment therefore undertakes research necessary for the provision of wholesome drinking water in the Water Quality and Health sub-Programme of its Water Directorate to satisfy the relevant policy needs. The sub-Programme is managed by the Drinking Water Inspectorate in the capacity of technical advisers.

1.3 The **aims** of the research managed by the Inspectorate are to:

- inform current Ministerial decisions
- guide the execution of policy
- monitor the achievement of goals
- address issues on which Ministers may need to take decisions in future
- assess risk, in particular in relation to new technology or processes that will not entail excessive cost to the consumer
- stimulate innovation in relation to the privatised water industry so as to enhance its competitiveness in world markets
- exercise the role of quality control in respect of research undertaken by operators and suppliers
- ensure that national, European and international guidelines or regulations are rooted in sound science and not based simplistically on the precautionary principle

1.4 To achieve these aims the research sub-Programme needs to engage in various **activities**. These include:

- commissioning clearly specified research into issues or areas of concern using **competitive tendering** methods to identify a research contractor who can provide the best value for money for the taxpayer.The research content should not be constrained by embracing only quality and health issues but should encompass socio-economic aspects also.

- establishing **collaborative research** with other public bodies, the privatised industry, European research organisations using EU Framework or other relevant funding and other international initiatives. In such collaborative work the component inputs and responsibilities of the collaborators must be well specified so that the interface between the various parties involved is clear. Back-to-back contracts rather than shared cost contracts should be used wherever possible.

- longer-term **strategic requirements** relating to the provision of ample cheap safe drinking water beyond the year 2000 should be identified and any necessary research implementation specified

- these three modes of research delivery should fall within designated **theme areas** defined as constituents of the sub-Programme and identified in a new Research Policy document for Drinking Water from which a Research Strategy has been derived. These two documents are to be regarded as Inspectorate "position statements" on research and signed by the Chief Inspector.

2 Objectives

- **To provide investigation and provision of information so that regulatory standards and procedures undertaken by and for the Drinking Water Inspectorate are based on scientific principles and provide the best available regulatory framework for the provision of wholesome drinking water that does not entail excessive cost**

- **To inform the assessment of risk in relation to the provision of water to drink and develop models for this risk assessment by the year 2000**

- **To quality assess drinking water research undertaken by other bodies**

- **To inform issues management in the provision of wholesome drinking water whether such issues are immediate or envisaged by the year 2000**

- **To stimulate innovation in the water industry in order to enhance its competitiveness in world markets**

- **To communicate information on research findings on drinking water and promote its take-up in a regular and systematic manner**

3 Appraisal

3.1 The appraisal of the sub-Programme will be undertaken widely within the public and private sectors so that relevant ideas and concerns are identified for research effort. Contributors to this process must be identified and their responsibilities known so that their input to the appraisal process and the interface of the organisation they represent with the research sub-Programme is clear. In particular roles as advisors or executors will be clearly differentiated. Likely contributors to appraisal meetings are DOE, DOH, MAFF, SOAD, DANI, ENVAG, OFWAT, WSA, UKWIR, FWR.

3.2 The process of appraisal and the purpose of it will be clearly set out in papers supporting any meetings held or canvassing any input. A flow-chart with dates of decision-making points is to be used. The basis for the sub-Programme is this ROAME statement supported by Research Policy and Research Strategy Documents prepared by the Drinking Water Inspectorate.

3.3 Scope for collaborative research nationally will be identified and planned so that those involved are clear as to committments and what is expected of them. The guiding principle will be one of "need to know". In general DWI concerns will be with policy and standards whereas industrial concerns will be with operation. Back-to-back contracts will be the preferred procedure. Particular attention will be paid to dissemination and use of outputs from the research before its initiation.

3.4 Collaborative research involving EU funding and European partners will be a particular goal. Initiatives may be required involving commissioning market research to ascertain research needs and identification of European partners.

3.5 Appraisal effort will be required to identify any longer term strategic needs in drinking water research relating to issues foreseen on a 5 year timescale. A desk study of such needs may be required either in defined sectors or overall which could be resourced externally.

3.6 Future research requirements will not be constrained to quality and health issues but might embrace, for example, socio-economic concerns and aesthetic aspects of water quality. Research fora will be held where issues of sufficient substance and interest demand it - in the interests of achieving well-specified research contracts and resilient tenders for the work.

4 Monitoring

4.1 The monitoring of the sub-Programme will be the responsibility of a Programme officer appointed for the purpose from within the Drinking Water Inspectorate. He/she will be tasked with putting in place systematic and consistent administrative procedures for projects undertaken within the Programme which record proposal/project identity numbers, appraisal decisions, tendering processes and outcomes, contractors appointed with contact information, timescales and funding, progress/interim (quarterly) reports, final reports, invoicing and payments, outputs and their dissemination.

4.2 Project information will be collated into a database of past, current, and proposed activity in standardised searchable format so that the activity of the sub-Programme can be accessed and reviewed overall by those with involvement or legitimate interest. The database will be used as a prime source of information for dissemination whether electronically, through Newsletter/bulletin or workshop. A consistent corporate style will be used in portraying the outputs of the sub-Programme .A dissemination strategy will be drafted and its implementation resourced possibly by commissioning an outside contractor. Desk studies on impacts of research outputs in designated sectors will be commissioned to demonstrate value for money.Attention will be given to the exploitation of research outputs commercially wherever this is appropriate.

4.3 Research contractors will be visited if problems arise or other issues require direct involvement of the Programme officer. Otherwise routine progress monitoring will be by monthly telephone conversation. Payment of invoices will be withheld if progress on a project is deemed unsatisfactory.

4.4 Arrangements for the monitoring of collaborative research (whether national, EU-based, or international) will be specified in writing between the parties involved at the outset and will address all implementation aspects from initiation to take-up of research outputs. Large projects whether collaborative or not may have separate management provision perhaps contracted from an external supplier or the involvement of an advisory group meeting at regular intervals to review progress and recommend any required changes of direction. Otherwise such matters will be the responsibility of the Programme Officer.

4.5 Each year prior to the initial "ideas meeting" currently held in midsummer to initiate the appraisal process an open forum will be organised to present aspects of current and recently completed research, provide a venue for discussion and interchange of ideas, and an avenue for the dissemination of information. It will also have a role in initating ideas to be taken account of in the appraisal process. This annual forum can be organised as part of the responsibilities of any dissemination contractor appointed to the sub-Programme.

5 Evaluation

5.1 The sub-Programme should be evaluated every five years. In view of the range of interfaces with different public bodies and private industry it would be preferable for outside evaluators to be used. Planning for the evaluation should commence one year prior to the exercise itself.

5.2 Standardised records of projects from initiation to take-up of outputs must be available in the form of project files, companion interim and final reports, records of meetings, and dissemination outputs. A list of contacts with whom discussion can be held should be available with job titles, organisation involved, and address and telephone numbers.

5.3 The evaluation should assess scientific quality, usefulness of the research, and value for money using a structured format both for desk study of documentation and interviewing of appropriate persons involved in commissioning , managing, implementing, and utilising the research. Results of any impact studies undertaken should be particularly noted.

5.4 Other factors of importance in the evaluation will be the extent and mode of collaborative work, success in attracting EU funding to research effort in the drinking water sector, effectiveness of management, and awareness of the sub-Programme activities in the drinking water community and more widely. The strategic positioning of the research sub-Programme in relation to the overall national endeavour in research on water and related issues will be an important judgement to be made in the evaluation.

5.5 Specialised knowledge will be required particularly to develop quantitative assessments of scientific quality so appropriate technical input will be required in the Review team tasked with the evaluation. In addition a sensitive awareness of the policy issues germane to the provision of wholesome drinking water to the consumer will be necessary.

5.6 Overall the evaluation will be conducted using the attributes set out in this ROAME statement as parameters against which the performance of the sub-Programme will be judged. The outcome of the evaluation itself will be a report to management guiding the future appraisal and implementation of the sub-Programme. If appropriate the report could be made available to a wider audience in published format.